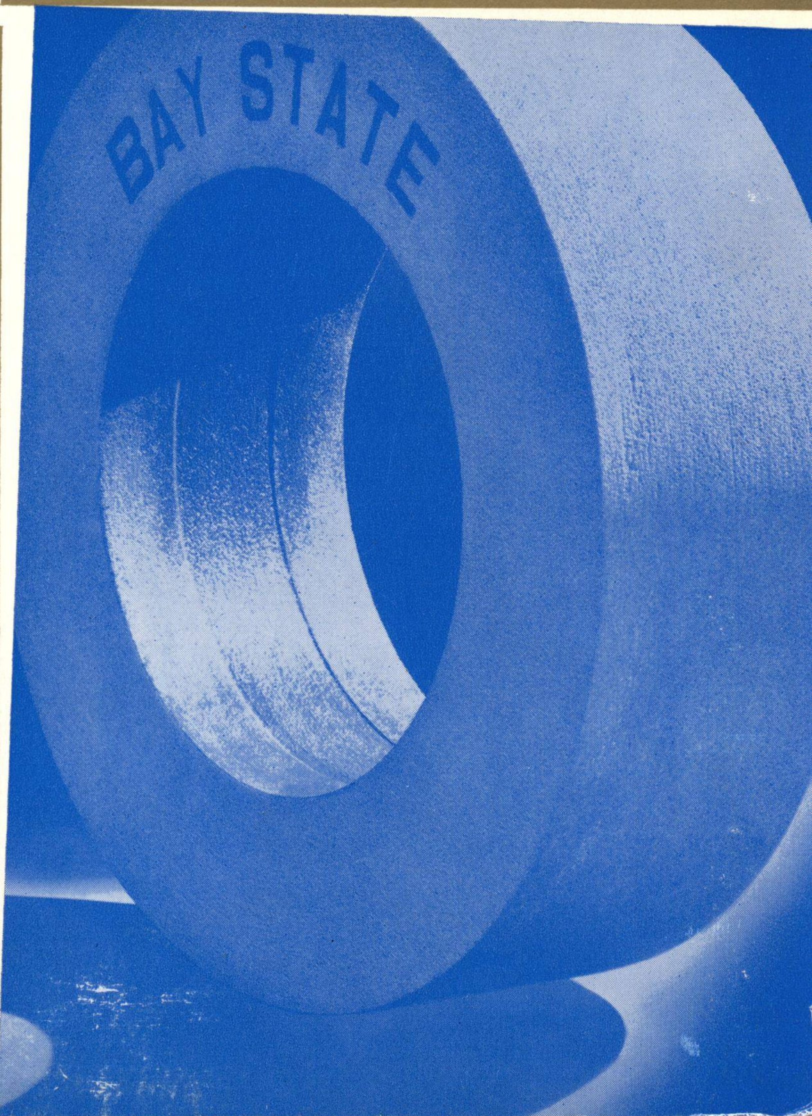
HANDBOOK . . .

about Grinding Wheels and other Abrasive Products

BAY STATE
WHEELS of PROGRESS

**BAY STATE
ABRASIVE
PRODUCTS CO.
Westboro,
Massachusetts,
U. S. A.**



Introduction

This handbook has been prepared by the BAY STATE ABRASIVE PRODUCTS COMPANY, of Westboro, Massachusetts. It is one of our company's constant contributions toward better grinding and greater understanding of grinding.

The dependable high quality of BAY STATE's complete line of abrasive products and its proven ability to develop new ideas for the whole industry have won for our company its position as a leader in the field of abrasive product manufacture.

Such leadership is expressed by the BAY STATE **"Wheels of Progress"** symbol, and brings with it the moral responsibility to effect still greater progress in the future.

Index

SUBJECT PAGE

Basic Knowledge 4

Bayflex®

  Straight Wheels 27

  Reinforced Disc-Wheels 57

Bench Grinding Wheels 21

Blue Flash® Reinforced Disc-Wheels 58

"BGR" Reinforced Masonry Cut-off Blades . . 66

Centerless Grinding Wheels 23

Cut-off Wheels 27

Cylindrical Grinding Wheels 31

Diamond Wheels 35

Disc Grinding Wheels 37

DuraCut® Abrasive Discs 57

GRITCLOTH® 41

Honing and Refined Surface Finishing 43

Hustler Cut-off Wheels 29

Internal Grinding Wheels 47

Index

SUBJECT . . . PAGE

Koolie Hat® Wheels . . . 56

Masonry Grinding Products . . . 66

Minute-Man Products . . . 66

Mounted Wheels . . . 51

Oilstones . . . 65

Refractories . . . 68

Reinforced Raised Hub Disc-Wheels . . . 55

Saf-T-Cut, "BY" and "BZ"
Reinforced Straight Wheels . . . 27

Snagging Wheels . . . 59

Special Products . . . 63

Specifications, Recommended . . . 81

Surface Grinding Wheels . . . 69

Terrazzo Wheels and Rubs . . . 64

Thread Grinding Wheels . . . 73

Tool Room Grinding Wheels . . . 75

What Is a Grinding Wheel?

A grinding wheel is a multi-edge cutting tool made up of thousands of sharp abrasive particles held together in the required size and shape by a suitable bond.

The function of each abrasive particle (or grain) is to cut or remove stock much the same as any single point cutting tool. The difference is that the abrasive particle fractures many times during the grinding operation to present new cutting edges. When worn out, it is released through bond breakdown to allow other sharp abrasive particles to take over the cutting job.

The function of the bond is to hold the abrasive grains together, helping them to withstand the pressure of the wheel against the work. At the same time, the bond must possess the important characteristic of being able to break down at the exact moment the abrasive has become dull. This releases the dull abrasive particles and presents new, sharp particles to the surface in a self-dressing fashion.

The purpose of these multi-edge cutting tools called "grinding wheels" is to cut or remove stock by abrasive action. They do this in a shorter length of time, at a lower cost, to closer size tolerances and/or to a higher degree of finish than can be accomplished by any other tool or series of tools.

What Are Abrasives?

Abrasives are relatively hard materials which, when crushed and sized to uniform granular particles, possess sharp cutting edges.

Several natural abrasives, including emery, sandstone, garnet, corundum, and diamonds, have been used for grinding operations. Diamonds, however, are the only natural abrasive still used in sizeable quantities for modern grinding operations.

Most of the grinding wheels in use today are made of manufactured or man-made abrasives. There are many different brand or trade names for these, but practically all of them are of either the aluminum oxide or silicon carbide types.

Basically, there are three main types of aluminum oxide abrasive: regular (tough), semi-friable, and white (friable or easily fractured). Combinations of these types are also used. Aluminum oxide types are usually used for grinding steel and other high tensile materials.

There are also two main types of silicon carbide: regular (black), and green. These two types are also used in combination. Silicon carbide abrasives are used for grinding low tensile materials such as cast iron or aluminum, and also extremely hard materials like glass or cemented carbides.

The natural diamonds used in grinding wheels are of the same origin as the gem variety, but lack the luster and other beauty requirements of gem stones. Man-made diamonds are also widely used.

Diamond wheels are used for grinding hard materials such as glass, stone, and cemented carbides. They cost more than silicon carbide abrasive wheels, but hold size and last so much longer that they are often more economical on production operations.

"A"

BAY STATE refers to its aluminum oxide abrasives as "A" abrasives. The letter "A" denotes regular or tough aluminum oxide, "3A" and "7A" semi-friable types, and "9A" a white, highly friable aluminum oxide. (2A and 8A are combinations of the above.

Manufactured abrasives are made by fusing bauxite in an electric arc furnace at about 3500° F. Coke and iron borings aid in the reducing process, and the cooling conditions govern the crystalline formation. The resulting mass is then broken up, crushed, and sized to the various usable grain sizes.

"C"

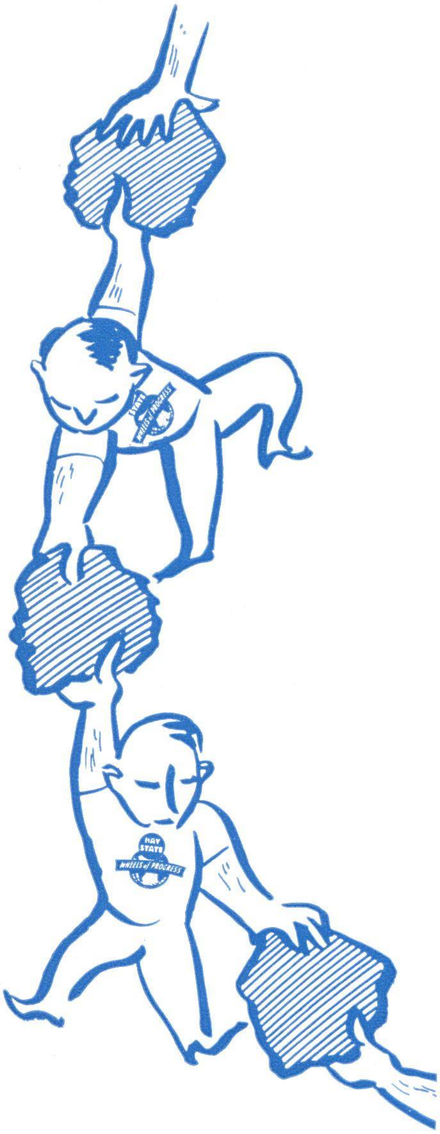
BAY STATE silicon carbide abrasives are referred to as "C" abrasives, "C" denoting regular or black and "1C" denoting green silicon carbide. (3C is a combination of the two.)

This abrasive also is a manufactured type. It is made by converting pure silica sand and petroleum coke into silicon carbide in a resistance type electric furnace at nearly 4000° F. After cooling, the resulting mass is broken up, carefully sorted, crushed and sized to the usable range of grit sizes.

"D"

Diamond, the hardest material known, is almost pure carbon crystal. Both natural diamond and man-made diamonds are used in grinding wheels. Natural diamond, designated as "D," is used in both resin and metal bonded diamond wheels. Selected Natural Diamond (7D) and Selected Natural Diamond Treated (8D) are used in resin bonded wheels when a more friable type diamond is desired.

Man-made Diamond (6D), also of shapes which provide more friable grit for resin bonded diamond wheels, are recommended for all grinding of carbide. 3D is the designation of tougher blocky man-made shapes for use in longer lasting metal bonded diamond wheels.



What Are Bonds?

Grinding wheel bonds are materials that can be mixed or combined with abrasive grains by mechanical means and then by firing, curing or other similar processing, form a more or less solid matrix holding the abrasive grains in a definite spacing and forming a product of definite size and shape.

New bonding materials are being developed all the time. Those most commonly used in today's grinding wheels are vitrified (ceramic), resinoid (plastic), rubber (both natural and synthetic), shellac, and metal (sintered powdered metals). The new reinforced resinoid bonds, a variation on the resinoid bond, are also quite popular today. These utilize reinforcing materials such as nylon and fiberglas, to provide greater breakage resistance on rough grinding or cutting applications.

The "grade" of a grinding wheel is the common terminology used in reference to the holding power, degree of strength or "hardness" of the bond. As the letter grade (in the wheel marking) goes from A to Z, more bond is used to hold on to the abrasive grains, thereby providing more resistance to the forces of grinding. These forces are compression, shear, and impact which tend to tear the abrasive particles from the grinding surface of the wheel. If relatively small forces are present, smaller amounts of bond are used, thereby producing a softer grade wheel which will break down easily and release worn grains as they become dull.

What Are Bonds? (Continued)

VITRIFIED

Two forms of this ceramic bond are used in grinding wheels:

1. The "Glass" type, with Aluminum-Oxide abrasives.
2. The "Porcelanic" type, with Silicon Carbide abrasives.

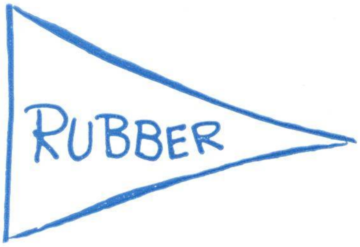
Approximately 50% of all grinding wheels are made in Vitrified bond. Their porosity and rigidity provide fast, economical stock-removal, and make them especially well-suited to precision grinding. Low speed snagging (up to 6500 s.f.p.m.) and other general-purpose grinding operations also use Vitrified wheels.

RESINOID

This bonding material is a thermal setting plastic. Because of its great strength and rigidity, Resinoid bonded wheels may be operated at higher speeds (up to 9500 s.f.p.m.) than Vitrified wheels. Since they are also capable of withstanding more severe and abusive grinding stresses, Resinoid wheels are the present-day choice for most high-speed rough grinding and cut-off operations.

Because Resinoid products are made at relatively low curing temperatures, special safety and mounting devices can be readily built into them.

RUBBER

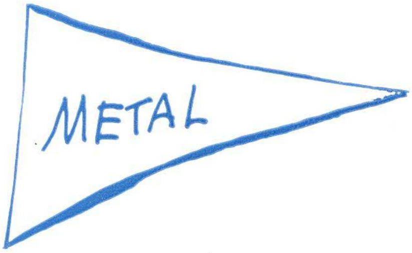


Both synthetic and natural types of rubber are used as bonds in the manufacture of grinding wheels. In the softer types, the resiliency of this bond makes excellent polishing wheels. The harder types provide a degree of resiliency plus water-resisting qualities for safe, cool-cutting, cut-off wheels, used where burr and burn must be held to a minimum. Other uses are in race grinding, and feed wheels for centerless grinding.

SHELLAC

Free cutting and water resistant, shellac bonded wheels are especially good for producing the high finish required in roll, camshaft, and knife or cutlery grinding. Although in recent years often replaced by Resinoid, the Shellac bond still has qualities difficult to duplicate for critical finishing applications.

METAL



Used only in the manufacture of diamond wheels, the Metal bond is both strong and ductile. Because of this ductility, the diamond particles are firmly held in a shock-resistant bond, while "at work," and are not easily removed until fully used.

What Are Structures?

This relates to the grain spacing in the wheel. The closest grain spacings are denoted by low structure numbers and are referred to as being dense. Higher structure numbers indicate open grain spacings.

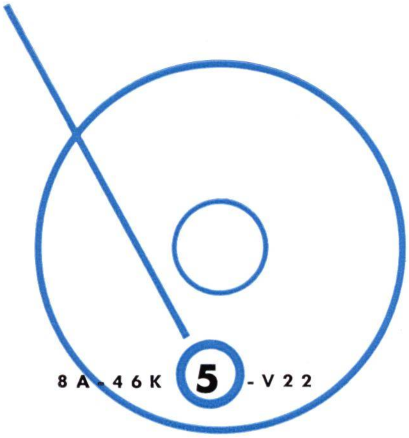
Low structure numbers, close grain spacing, are used for line contact grinding such as cylindrical grinding.

High structure numbers, wide grain spacing, are used for broad contact grinding such as surface grinding.

When 12 structure is used in vitrified wheels Bay State's induced porosity "Koolpore," is also incorporated. This is a process in which extra large voids are provided by mixing-in a foreign material which will burn out during firing thus providing an extra porous wheel in addition to the wide grain spacing.

There are standard structures for every specification, so in most cases the determination of structure should be left to the manufacturer.

GRAIN SPACING



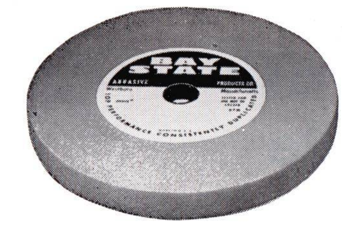
Fundamentals of Grinding

1. Increase of work speed increases grain depth of cut and makes the wheel appear softer.
2. Decrease of work speed decreases grain depth of cut and makes the wheel appear harder.
3. Increase of wheel speed decreases grain depth of cut and makes the wheel appear harder.
4. Decrease of wheel speed increases grain depth of cut and makes the wheel appear softer.
5. Reducing diameter of grinding wheel increases grain depth of cut and makes wheel appear softer.
6. Increasing diameter of grinding wheel reduces grain depth of cut and makes wheel appear harder.
7. If the work diameter is reduced, the grain depth of cut increases and makes wheel appear softer.
8. If the work diameter is increased, the grain depth of cut decreases and makes wheel appear harder.
9. For rapid stock removal when finish is no object use a large grain coarse grit size in an open structure.
10. For finish grinding use fine grit sizes.
11. When grinding soft materials use coarse grit sizes.
12. When grinding hard materials use fine grit sizes.

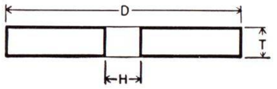
There may be operations which require some adjustments to these principles but they hold true for general overall usage.

Standard Wheel Shapes

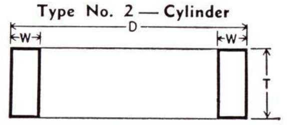
While the nine wheel shapes illustrated on these pages represent the standard grinding wheel shapes and faces established by the National Bureau of Standards, it would be impossible to display here all the size variations in which these shapes and faces are available. For full information regarding dimensions for your particular problem, write BAY STATE. Our engineers will be glad to furnish any desired data.



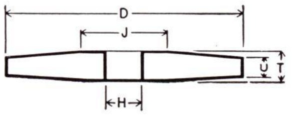
Type No. 1 — Straight

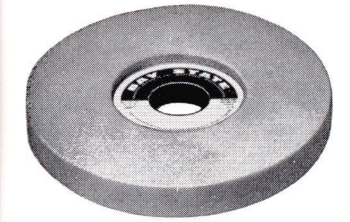


Type No. 2 — Cylinder

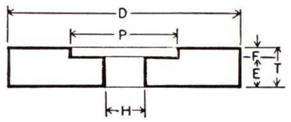


Type No. 4 — Tapered Two Sides

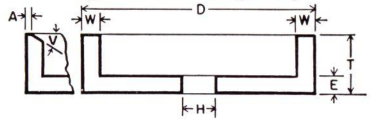


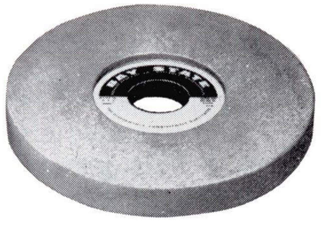


Type No. 5 — Recessed One Side

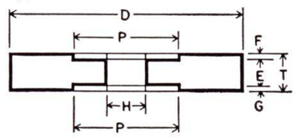


Type No. 6 — Straight Cup

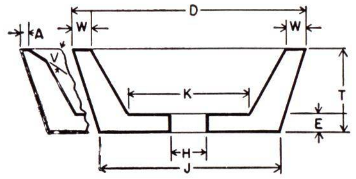




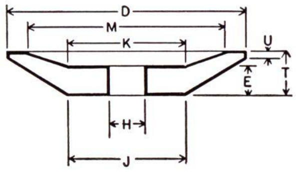
Type No. 7 — Recessed Both Sides

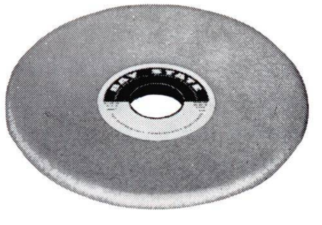


Type No. 11 — Flaring Cup

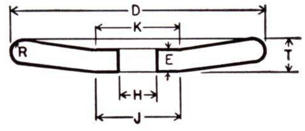


Type No. 12 — Dish

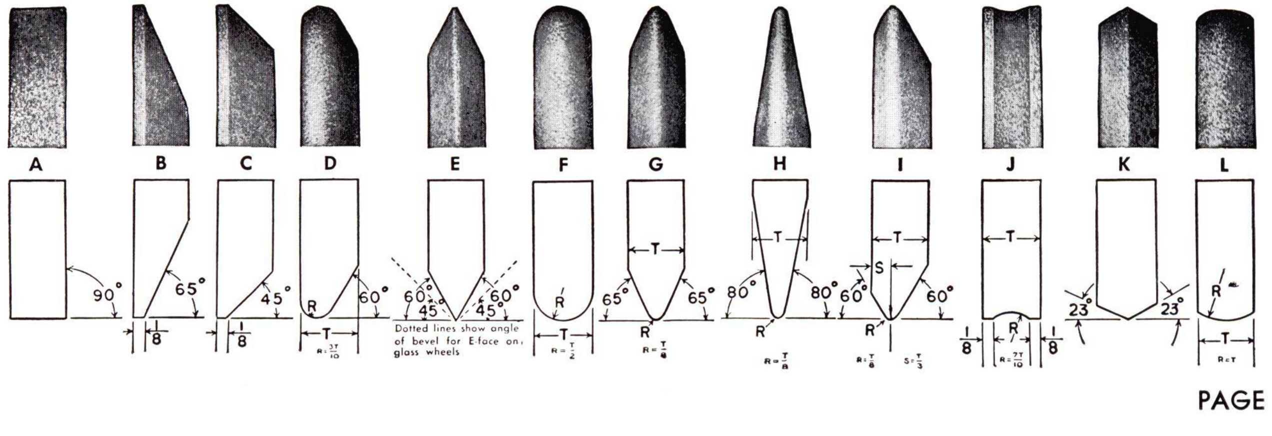




Type No. 13—Saucer (Saw Gummer)

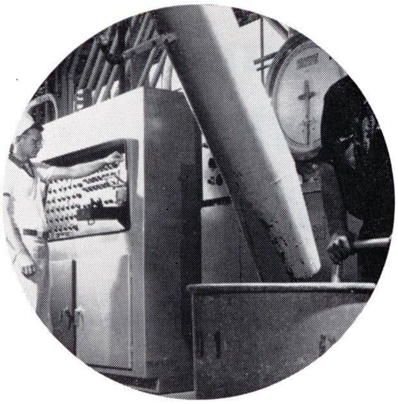


Standard Wheel Faces



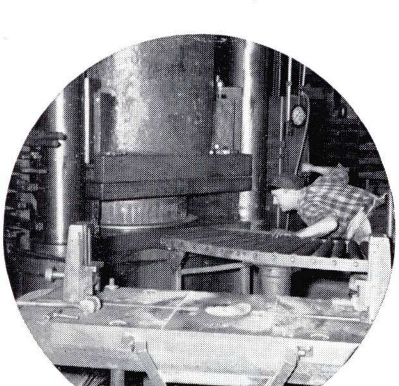
How BAY STATE Abrasive Products Are Made

BAY STATE's success in producing high quality abrasive products is largely due to the precision and care with which each of the following steps is taken. These are basic for all types of abrasive products, although the details will vary from product to product.



Great accuracy is exercised in weighing abrasive grain from storage tanks

To insure uniformity, the mixture of grain and bond must be evenly distributed



After thorough mixing, the abrasive and bond are pressed in a mold by means of a hydraulic press

Step 1. *The abrasive grains are weighed out in precisely the correct amounts.

Step 2. *The required bonding material is also carefully weighed.

Step 3. *Abrasive and bond are thoroughly mixed and screened until complete uniformity is assured.

Step 4. The mixture is uniformly distributed in each carefully checked mold of definite volume.

Step 5. Within the molds, the mixture is hydraulically pressed to exact density or grain spacing, referred to as "structure."

Step 6. The "welding" of bond to abrasive is achieved by heat (up to 2300° F., in the case of Vitrified), pressure (up to 11,000 lbs. per sq. in.) or a combination of both, depending upon the bond type. Curing temperatures for resinoid and rubber products run up to only 390° F.

Step 7. The exact hardness or grade of each product is checked and confirmed by such modern means as stroboscopic and sonic testing equipment.

Step 8. Bushings, steel backs, or other mounting devices are safely secured, where required.

Step 9. Exact shape, size, balance, and "truth" (perfect concentricity) are given each wheel, by grinding, truing, or, in some resinoid products, dieing-out processes.

Step 10. Wheels are speed-tested in accordance with the American Standard Safety Code B7.1.

Step 11. The BAY STATE stenciled markings, or a wheel blotter are applied.

The BAY STATE wheel blotter performs three important functions:

1. It assures you that the all-important "care and precision" have been built into the wheel you get.
2. It gives you the **exact** specification of the wheel and its maximum safe operating speed.
3. Being thick and soft, it equalizes pressure on the wheel when mounted between flanges.

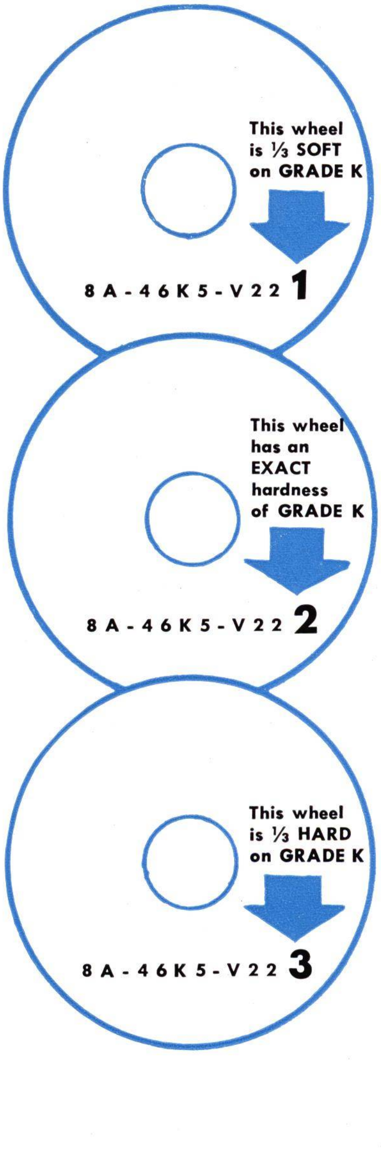
**Electronically controlled, automatic weighing and mixing operations ensure that each custom-formulated wheel gets* exactly *the right ingredients to fit each specification.*

Why BAY STATE Abrasive Products Are Different

FRACTIONAL GRADES

Each step of BAY STATE's manufacturing is carried out under the most rigid standards of quality control. Even mold-size variation, due to wear, has been determined so that new molds are substituted **before** product variation becomes critical.

"Fractional Grades," an exclusive BAY STATE feature, provides **3** degrees of hardness for each single normal grade of Vitrified and Resinoid bonds. This allows three times as many grades of hardness from which to choose the **exact** one for a given grinding assignment. This one fact alone gives BAY STATE users terrific advantages in the selection of wheels for maximum performance and efficiency. Grade "K," for example, is a standard hardness degree. BAY STATE calls this "K-V2," and makes along with it "K-V1" (1/3 grade softer), and "K-V3" (1/3 grade harder).


This wheel is ⅓ SOFT on GRADE K
8A-46K5-V22 1
This wheel has an EXACT hardness of GRADE K
8A-46K5-V22 2
This wheel is ⅓ HARD on GRADE K
8A-46K5-V22 3

How BAY STATE Wheels Are Marked

BAY STATE wheel markings are easily understood because they give, in a logical order, the complete information you need to determine the wheel's characteristics. In simple, concise form, the markings give the abrasive type, abrasive size, grade (hardness), grain spacing (structure), bond type, and fractional grading indication.

This system conforms to the standard marking system as used throughout the grinding wheel industry.

9A-463 K5-V22 AE

KINDS OF ABRASIVE

Reg. Alum. Oxide	A
" " "	1A
Spec. Alum. Oxide	2A
" " "	3A
" " "	4A
" " "	5A
" " "	6A
" " "	7A
" " "	8A
" " "	LA
" " "	RA
" " "	VA
" " "	SA
White Alum. Oxide	9A
Reg. Sil. Carbide	C
Green Sil. Carbide	1C
½ Reg. Sil. Carbide ½ Green Sil. Carbide	3C
Spec. Sil. Carbide	7C
½ Alum. Oxide ½ Sil. Carbide	CA
½ Spec. Alum. Oxide ½ Sil. Carbide	MA GA
Diamond	D 2D 3D 6D 7D 8D

GRAIN SIZE

COARSE
10
12
14
16
20
24

MEDIUM
30
36
46
54
60

FINE
70
80
90
100
120
150
180

VERY FINE
220
240
280
320
400
500
600

GRAIN COMBINATIONS
1
2
3
4
5
6

GRADES

SOFT
C
D
E
F
G
H
I

MEDIUM
J
K
L
M
N
O
P

HARD
Q
R
S
T
U
V
W
X
Y
Z

STRUCTURES

DENSE
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
OPEN

BOND TYPES
B = RESINOID
E = SHELLAC
F = BAYFLEX
M = METAL
R = RUBBER
V = VITRIFIED

BAY STATE SYMBOLS

VITRIFIED BONDS
V22
V32
V72
V82
V92
VA2
VS2
VG2
VL2
VM2

RUBBER BONDS
R22 RF2 RI2 RM2
RE2 RG2 R72 RQ2 RC2

SHELLAC BONDS
EC2
EH2

RESINOID BONDS
BA2 BC2 BE2
BK2 (cork res.)
BS2 BW2 BJ2

REINFORCED RESINOID
BAYFLEX FA2 FP2 FD2
BLUE FLASH BF2
DURACUT BB2
MASONRY BG2
SAF-T-CUT BY BZ2
KOOLIE HAT BFK
HUSTLER BH2

FRACTIONAL GRADINGS
(Exclusively Bay State)
1 = 1/3 Grade Soft
2 = Exact Grade
3 = 1/3 Grade Hard

MFG. SYMBOLS

Selecting the *Exact* BAY STATE Wheel

Selecting the **exact** wheel for each job is a vital factor in efficiency, finish, and production in modern cost-conscious grinding.

BAY STATE offers three simple ways to find the specifications you need.

1. From this handbook, under a particular type of grinding.
2. Under "Recommended Specifications" in this handbook (p. 81), here classified by materials or the names of parts.
3. By providing "On-the-Job" engineering service for unusual grinding applications or special job requirements. Experienced abrasive specialists work in **your** plant with **your** equipment and materials to find practical answers to any wheel selection problem.

Ordering BAY STATE Wheels

An effective order for grinding wheels should state clearly the desired:

1. Quantity
2. Size
   Show O.D. Thickness, Arbor Hole diameter, and tolerances, if necessary.
3. Shape
   Standard shapes are numbered, as shown on page 9. For special shapes, use dimensioned sketches plus tolerances, if required.
4. Specifications
   Use the marking system described on page 12.
5. Mounting Requirements
   Include all essential thread sizes, dimensions and locations of spindles, studs, nut inserts, plates, etc.
6. Billing and shipping instructions.

In re-ordering BAY STATE wheels it is best to refer to a previous order number, or get the data from wheel markings or blotters on wheels still in use.

If there is any doubt, our Abrasive Specialists can give you what you need if you tell us the type of grinding, material and finish requirements, and the name and size of the grinding machine.

In the case of a grinding problem which is entirely new to you, immediately request BAY STATE's "On-the-Job" engineering service. It will serve you well.

BAY STATE ®
WHEELS of PROGRESS

General Principles of Grinding

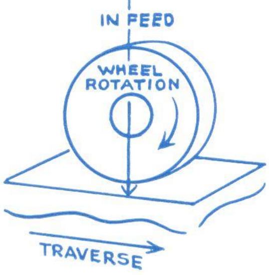
Grinding requires relative motion of the abrasive product and workpiece while the two are in contact under pressure. A grinding wheel always rotates, in operation, but the wheel, workpiece, or both, may also move:

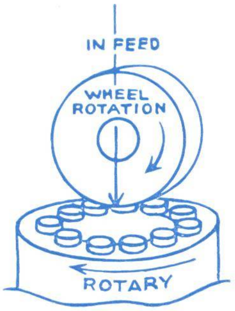
1. Perpendicularly to the surface being ground. This is called "Infeed." It establishes grinding contact and determines the depth of cut.
2. Parallel to the work, in traverse motion or rotation. This motion extends the area of grinding.

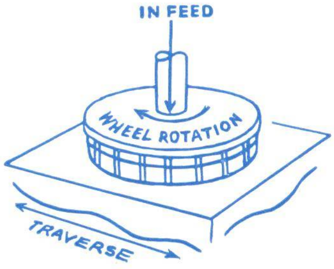
The speed of a grinding wheel is measured in either revolutions per minute (r.p.m.), or surface feet per minute (s.f.p.m.). These two are related, the s.f.p.m. being always just a little more than three times (3.1416) the answer obtained by multiplying the speed in r.p.m. by the diameter in feet.

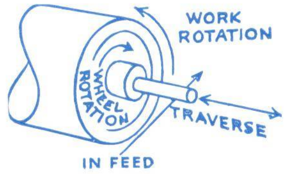
Maximum safe operating speeds (r.p.m.) are plainly marked on BAY STATE wheels, blotters, tags, and containers. They should **never** be exceeded when the wheel is of full size. As a wheel becomes worn to a smaller diameter, it is often advisable to increase the r.p.m. to maintain efficient s.f.p.m. for proper grinding, **but** . . . this should **never** be done without first checking that the new speed is safe for the diameter of wheel in use.

For details of general grinding wheel safety practice, see "The American Standard Safety Code for Use, Care, and Protection of Abrasive Wheels," published by the American Standards Association.

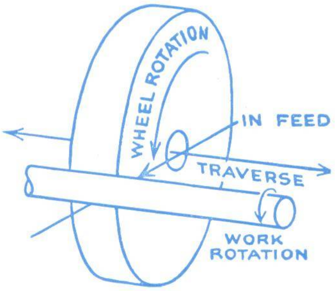








General Principles of Grinding (Continued)



When the workpiece rotates, its speed (measured like the wheel speed) is an important grinding factor. Increasing it, in cylindrical grinding for example, makes the wheel act "softer," and vice versa. For a full discussion of this phenomenon and others like it, see "The Grinding Wheel" written by Kenneth B. Lewis under the auspices of the Grinding Wheel Institute.

Grinding-pressure, produced by infeed, must be limited to amounts which avoid damaging the workpiece through excessive heat, or distortion.

Coolants, lubricants, or combinations of these are often used to help dissipate heat, and prevent loading of the wheel by washing away chips. These also affect the quality and speed of the grinding.

The grinding wheel's performance also depends upon the condition of the machine on which it is used and the smoothness and uniformity of its infeed and traverse motions. These must be under close control at all times, without vibration, looseness, or "play" in spindles, steadyrests, or other machine parts.

Successful grinding, then, depends upon many factors, including speeds, feeds, and coolants as well as the specification of the wheel itself.

BALANCING

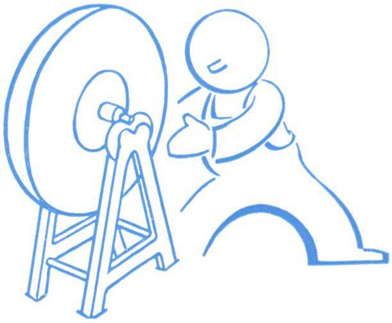
For precision grinding and perfect surfacing, proper wheel balance is imperative. When a wheel is out of balance, the contact between work and wheel, which should be smooth and continuous, is interrupted and cuts of varying depth result that mar the surface. Proper balance, while important in all wheels, is especially essential in large wheels as their greater mass serves to accentuate the difficulties caused by improper balance.

General Principles of Grinding (Continued)

One cause of an unbalanced wheel may be wear, since wear is not always distributed evenly. Absorption of grinding fluids by wheels of high porosity may cause them to seem unbalanced.

Various excellent types of balancing equipment are available. One which is widely used and simple to operate has a stand with two sets of ball-bearing mounted wheels which overlap to form two "V's". The arbor of the wheel to be balanced rests in these and turns freely.

Parallel ways which are perfectly level are also used for balancing. After mounting on a special spindle, the unit to be balanced is placed on the ways, with the wheel parallel to them, and the balance adjusted by disposition of weights.



MOUNTING

Proper mounting is essential to prolonged wheel life, and faulty mounting is one of the greatest causes of breakage.

A common fault is excessive tightening of flanges, which causes springing and distortion of the flanges. This condition usually results in uneven pressures on the wheel and sets up excessive strains which can cause the wheel to break.

Flanges should be kept free of any foreign matter, and blotters or gaskets must be flat and smooth to avoid creating unequal pressure on the wheel. Otherwise the wheel will not run true, or may crack and break.

It is also important that the wheel fit the arbor perfectly, since too tight a fit, which would necessitate forcing the wheel on the arbor, is likely to cause damage to the wheel. Too loose a fit on the other hand may cause considerable initial run-out making it difficult to true-in the wheel and can also allow the wheel to move or slip between the flanges and break on contact with the work.

General Principles of Grinding (Continued)

Truing and Dressing

Proper performance and efficiency of a grinding wheel depends to a large extent upon regular truing and dressing. While these two operations are similar, they are not identical, differing as to their purpose.

TRUING is done either to alter the shape of a wheel, or to make its face concentric and its sides parallel.

DRESSING has for its purpose, changing the nature of the wheel's cutting action by tearing away or breaking down the abrasive particles that have become dull or "loaded." If the wheel being used requires too frequent dressing to keep it open and sharp-cutting, a softer grade wheel should be obtained for the job.

TOOLS for truing and dressing are so similar that they are often used for both operations. They must be rigidly held, for satisfactory operation, and fall into three basic types:

1. **Steel**
   Star, or "Huntington"; Corrugated Disc; Locked Disc; and Precision Steel types.
2. **Abrasive**
   Square Sticks; Round Sticks; Silicon Carbide Wheels.
3. **Diamond**
   Single Point; Multi-Point.

These Are Musts!

1. Dress all wheels at regular intervals, as necessary.
2. Keep predetermined rates of traverse and depth of cut consistently.
3. Dress or true wheels at operating or slower speeds, but *not* at higher than operating speed.
4. Truing tools should be rigidly fixed in relation to point of contact with the wheel.
5. Dress a wheel under the same conditions as it is operated, whether wet or dry.
6. Use the right type of dresser for the particular purpose.

Safety

Refer to the "American Standard Safety Code for the Use, Care, and Protection of Abrasive Wheels"

Grinding Wheels Are Safe Use . . . But Don't Abuse

DO and DON'T

1. DO always HANDLE AND STORE wheels in a CAREFUL manner.
2. DO VISUALLY INSPECT all wheels before mounting for possible damage in transit.
3. DO CHECK MAXIMUM OPERATING SPEED marked on wheel against machine speed.
4. DO CHECK MOUNTING FLANGES for equal and correct diameter. (Should be at least 1/3 diameter of the wheel and relieved around hole.)
5. DO USE MOUNTING BLOTTERS supplied with wheels.
6. DO be sure WORK REST is properly adjusted. (Center of wheel or above; no more than 1/8″ away from wheel.)
7. DO always USE A GUARD covering at least one-half of the grinding wheel.
8. DO allow NEWLY MOUNTED WHEELS to run at operating speed, with guard in place, for at least one minute before grinding.
9. DO always WEAR SAFETY GLASSES or some type of eye protection when grinding.
10. DO TURN OFF COOLANT before stopping wheel to avoid creating an out-of-balance condition.

1. DON'T use a wheel that HAS BEEN DROPPED.
2. DON'T FORCE a wheel onto the machine OR ALTER the size of the mounting hole—if wheel won't fit the machine, get one that will.
3. DON'T ever EXCEED MAXIMUM OPERATING SPEED marked on the wheel.
4. DON'T use mounting flanges on which the bearing surfaces ARE NOT CLEAN AND FLAT.
5. DON'T TIGHTEN the mounting nut EXCESSIVELY.
6. DON'T grind on the SIDE OF THE WHEEL unless wheel is specifically designed for that purpose.
7. DON'T start the machine until the WHEEL GUARD IS IN PLACE.
8. DON'T JAM work into the wheel.
9. DON'T STAND DIRECTLY IN FRONT of a grinding wheel whenever a grinder is started.
10. DON'T grind material for which the WHEEL IS NOT DESIGNED.

STORAGE

Proper storage facilities for grinding wheels must keep the wheels:

1. Dry.
2. At reasonably constant temperature.
3. Secured against rolling or falling.
4. Protected from falling objects or trucks.
5. Cushioned, if stacked one upon another.
6. Supported free from bending strains.

Do's

1. Provide proper racks, bins or drawers for storing various types of wheels.

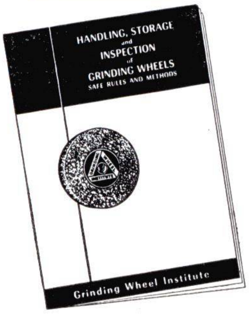
2. Store straight and tapered wheels on edge in racks with two point cradle support, and partitions separating wheels.

3. Use flat shelf for storing thin wheels with organic bond, laying them flat to prevent warping.

4. Stack cylinder wheels and large straight cup wheels with corrugated paper cushions between flat sides, or in same type racks used for large straight wheels.

5. Large flaring cup wheels may be stacked on flat shelf face to face and base to base.

6. Bins, boxes, or drawers may be used to store internal wheels, cups, and other wheels of small size.

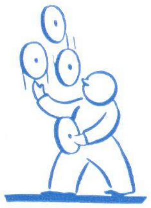


HANDLING, STORAGE
and
INSPECTION
of
GRINDING WHEELS
SAFE RULES AND METHODS

Grinding Wheel Institute

Send for Special Booklet

Don'ts



1. Don't handle wheels carelessly. This causes wheel breakage. Remember, grinding wheels are brittle and break easily.

2. Don't drop or bump wheels against one another or other objects.

3. Don't roll abrasive wheels as one might a hoop. They pick up foreign matter which injures their surface.

4. Don't pile heavy objects on top of wheels. Treat them as you would other fine tools.

5. Don't store in damp place, or where there is extreme heat or cold.

6. Don't store thin wheels on their edges as this causes warping.

7. Don't store wheels on edge without a means of preventing them from rolling.

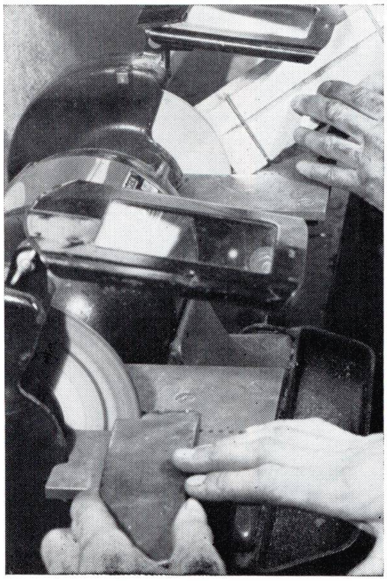
BAY STATE
WHEELS of PROGRESS

Bench GRINDING WHEELS

BAY STATE
ABRASIVE PRODUCTS CO
Westboro. Massachusetts
TESTED FOR USE NOT TO EXCEED RPM
ORDER
TOP PERFORMANCE CONSISTENTLY DUPLICATED
MADE IN U.S.A.

BAY STATE ® WHEELS of PROGRESS

Here, straight vitrified or reinforced resinoid wheels such as Bayflex are used for off-hand tool sharpening, cutting and notching.



Specifications

Most Common Sizes (Vitrified Grinding Wheels)

Diameters: 4, 5, 6, 7, 8, 10″
Thicknesses: ¼, ½, ¾, 1″
Holes: ½, ⅝, ¾, 1″

Most Popular Specifications

Misc. Gen. Purpose (Ferrous Metals)	Ferrous Metals Edge Cutting (Incl. Some Tools)	Non-ferrous Metals
A-24Q5-V22	3A-46L5-V22	C-46K5-V32
A-36O5-V22	3A-60L6-V22	
A-36N5-V22	3A-80L7-V22	
A-46N5-V22		
A-46M5-V22		
A-46L5-V22		
A-60M6-V22		
A-60L6-V22		
A-80M7-V22		

Most Common Sizes (Bayflex and Resinoid Cut-Off Wheels)

Diameters: 6, 7, 8, 10″
Thicknesses: $\frac{1}{16}$, $\frac{3}{32}$, ⅛″
Holes: ⅜, ½, ⅝, ¾, 1″

Most Popular Specifications for General Purpose Grinding

BAYFLEX (Reinforced)	RESINOID
A-24J16-FA2	A-46Q6-BJ22
A-36J16-FA2	A-46N6-BJ2RS
	A-46O6-BJ2RS
	A-60N6-BJ2

Centerless GRINDING WHEELS

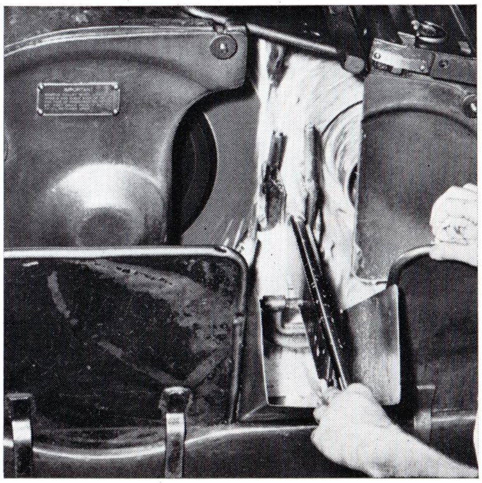
This is a type of cylindrical grinding where the work is not supported on fixed centers; rather by a combination of work rest-blade, rubber regulating wheel, and the grinding wheel.

Centerless Grinding

The advantages of centerless grinding over cylindrical grinding are: Greater production, no maintenance of centers and center holes, elimination of driving dogs and errors in centering, less stock needed for grinding, and uniform production of surfaces of almost unlimited length. The grinding action results from the difference in speeds of the grinding wheel and the regulating wheel.

There are three general types of centerless grinding:

1. **THROUGH FEED.** This type, illustrated on the right, is the most common type of centerless grinding. Here the work passes longitudinally through the machine, between the grinding and regulating wheels. Straight cylindrical surfaces are ground by this method.
2. **IN FEED.** Work having more than one diameter, tapers, or contours is ground by moving the grinding wheel toward the work. This is also called "plunge" grinding.
3. **END FEED.** This is a special method used for grinding tapered parts. The work is fed lengthwise between the wheels, against a stop.

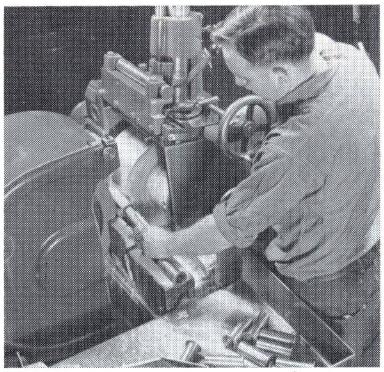


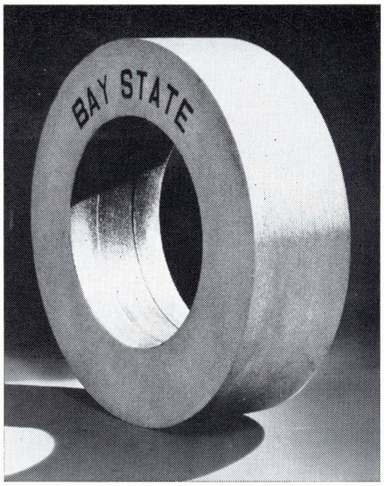
Commonly Used Sizes

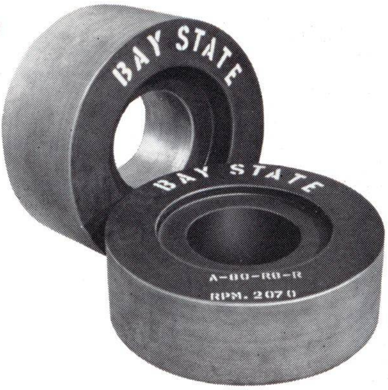
	Grinding Wheel	Regulating Wheel
O.D.	20–24″	12–14″
Thickness	3– 8″	3– 8″
Speed	6500 S.F.P.M.	36–900 S.F.P.M.

RECOMMENDED SPECIFICATIONS

Material	*Specification*
Aluminum and Alloys	C-54K6-V32
Axles (Autos)	A-46N5-V22
Ball Races, Radial (Hardened Steel)	3A-80K7-V22 3A-70M6-BC2
Bars	A-60N6-V22
Bolts (Case-hardened)	A-60N6-V22
Brass	C-361N5-V32
Bronze (Hard)	A-60M6-V22
Bushings (Cast Iron)	C-461L5-V32
(Hardened Steel)	A-60M6-V22
Carbon (Hard)	C-361N5-V32
Cast Iron	C-461M5-V32
Drills (Manufacture)	
(Soft)	3A-60N6-V22
(Hard)	3A-80M7-V22
Fiber	C-361N5-V32
Forgings	A-60M6-V22
Housings (Auto Axle)	A-60N6-V22
Pipe Balls (Manganese)	
(Roughing)	A-24R5-V22
(Regrinding)	A-30P5-V22
Pistons (Aluminum)	C-461I5-V32
(Cast Iron) (Roughing)	C-461L5-V32
(Semi-Finishing)	C-80K7-V32
(Finishing)	C-280R9-BC2
Piston Pins (Soft)	3A-60M6-V22
(Hard) (Roughing)	3A-80M7-V22
(Finishing)	A-120K8-V22
Plastics	C-461L5-V32
Porcelain (Roughing)	C-361K5-V32
(Finishing)	C-100I8-V32
Roller Bearing Cups	A-80L7-V22
Rollers for Bearings	
(Roughing)	3A-80M7-V22
(Finishing)	A-90R2-R22
Rubber (Hard)	C-361K5-V32
Spline Shafts	A-60O6-V22
Steel (Hardened)	3A-60L6-V22
Steel (High Speed)	3A-60L6-V22
(Soft)	A-60M6-V22
(Stainless—Free Machine)	C-54N6-V32
(Hard)	3A-60L6-V22
Titanium	3A-54M6-V22
Tubes (Steel)	3A-60M6-V22
Tungsten Rods	C-60J6-V32
Valves	3A-60O6-V22
Valve Tappets	3A-80N7-V22





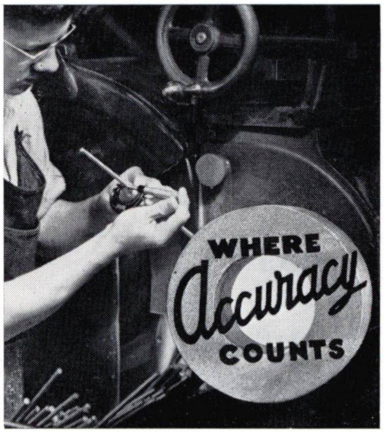


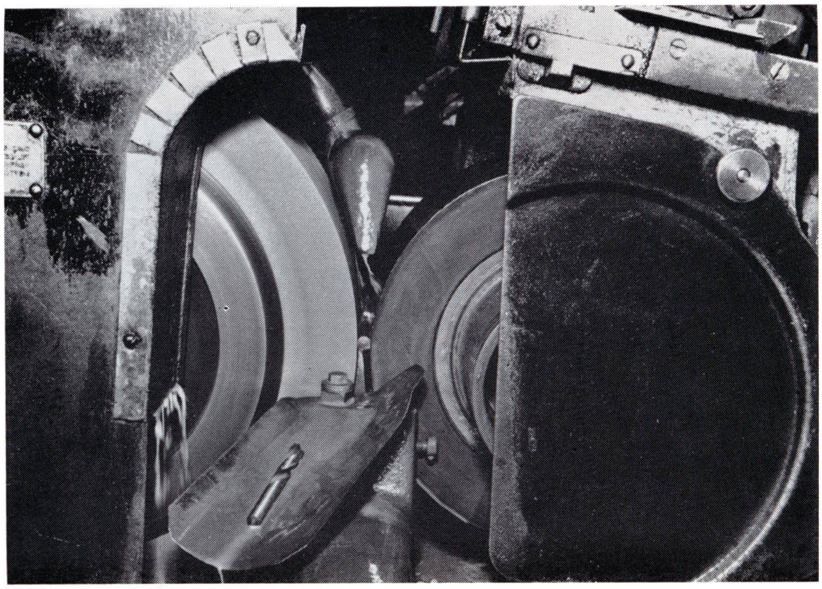
Rubber Regulating Wheels

Regulating, or "feed" wheels play an important part in the production power and excellent accuracy of centerless grinding.

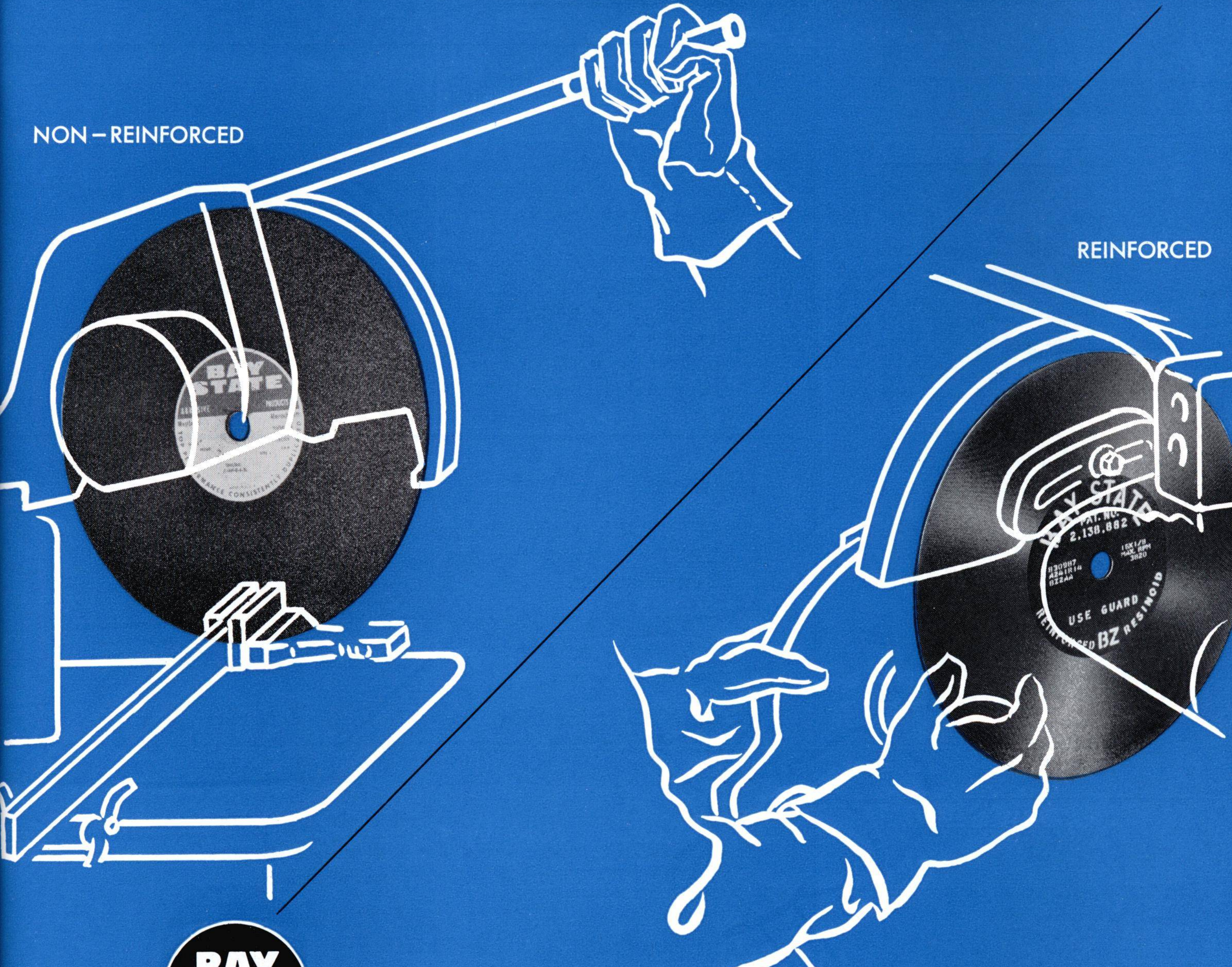
Much used by modern industry for such production grinding, are:

1. Through Feed Grinding. Here, with the workpiece confined, BAY STATE's A-80R8-R22 specification is most widely used.
2. Plunge Cut Grinding. Some of these operations tend to "throw spinners" (the workpiece actually flies out of the machine), indicating the need for better gripping action. For these cases, the A-80R2-R22 regulating wheel offers a remedy, since it provides more abrasive particles per unit area of wheel face.





Cut-Off WHEELS

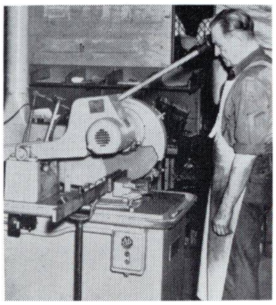


BAY STATE
®
WHEELS of PROGRESS

BAY STATE ABRASIVE PRODUCTS CO.
Westboro, Massachusetts, U. S. A.

Cut-Off Wheels

Twisting and flexing strains are almost unavoidable in hand-held operations. Here, reinforced wheels are *always* required.



Where the work is firmly clamped and wheel motion mechanically controlled, non-reinforced wheels offer special advantages.

"Wheels of Progress" for Every Type of Cut-Off Work

BAY STATE manufactures cut-off wheels and blades in a complete range of sizes and specifications. Each is designed to give maximum efficiency in its own job.

There is a BAY STATE wheel **exactly** right for each of your cut-off jobs. The following paragraphs give general reasons for their differences and uses. Basic information for wheel selection is given in the table on page 30. For special cases, ask for BAY STATE's Engineering Service, which is available without charge.

BASIC WHEEL TYPES

1. REINFORCED: for use in **all** operations where either the workpiece or the wheel is hand held, as with portable grinders, and foundry cut-off machines, including swing frames. Layers of high tensile fabric provide strength to withstand twisting shocks and side pressures.

2. NON-REINFORCED: for use where **extra** strength is not required. They offer the lowest cost, most efficient cutting performance where the workpiece is firmly clamped and the wheel is restricted to motion in one plane only, as in "chopper" type machines, and all enclosed wet cut-off machines.

ABRASIVES

1. ALUMINUM OXIDE: represented by the letter "A" in BAY STATE wheel markings, this abrasive is recommended for almost all metal cutting.

2. SILICON CARBIDE: known by the BAY STATE marking "C", this is recommended for most nonmetallics, including all masonry materials.

3. DIAMOND: identified by "D", Diamond abrasive is recommended for cutting the cemented carbides, ceramics, and stone.

BONDS

1. RESINOID: recommended for fast production and high wheel efficiency. Used most often in dry operations.

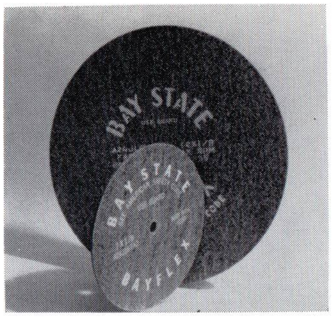
2. RUBBER: recommended for good finish, with a minimum of burn and burr, rubber bond is used mostly in wet cutting operations.

3. METAL: the extreme strength and tenacity of this bond is used only in Diamond cut-off wheels.

To match your job exactly, all BAY STATE cut-off wheels are available in a range of grit sizes, grades and structures. BAY STATE factory and distributor abrasive specialists can help you find the right combination for maximum performance.

BAY STATE®
WHEELS of PROGRESS

BAY STATE CUT-OFF WHEELS OFFER SPECIAL ADVANTAGES for each type of application, and are well known by the following trade names:

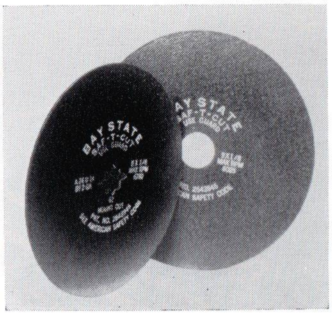


BAYFLEX FA2

Available in diameters up to 10″, Bayflex excels in light cut-off operations where good finish is required. Since Bayflex resists loading, it is particularly good on soft, ductile metals such as aluminum.

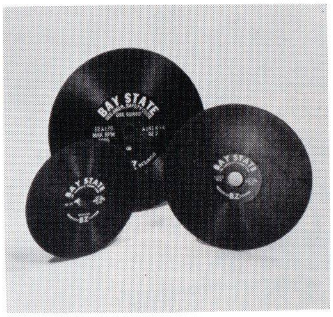
BLUE FLASH BF2

Fast, free cutting, high strength, and a wide range of specification possibilities give Blue Flash exceptional versatility in foundry cut-off work, including swing frame operations. Particularly recommended for cutting non-ferrous metals, BF2 wheels work wonders through heavy cross-sections of tough manganese and aluminum bronzes.



SAF-T-CUT BY2

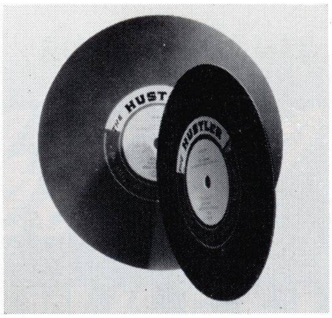
Recommended for light duty in sizes up to 10″ diameter. BY2 combines excellent durability with free cutting, for machines of limited horsepower. Sizes and arbor holes for all types of light cut-off equipment.



SAF-T-CUT BZ2

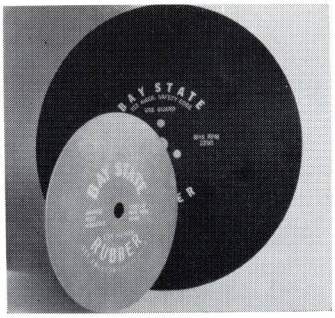
Recommended for rugged work, using wheels 14″ and over. BZ2 is strongly reinforced for foundry swing frame and floorstand use. It gives maximum performance with ample horsepower, cutting the hard ferrous metals such as steel and steel alloys.

For general recommendations, use the listings in the next page. Use BAY STATE's "On-the-Job" Engineering Service for difficult problems. It's yours for the asking.



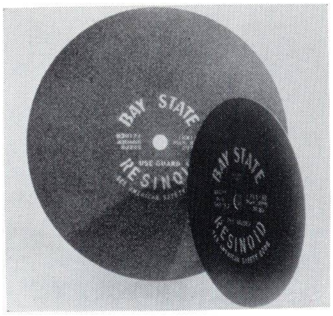
THE HUSTLER

The HUSTLER cut-off wheel is a totally new abrasive product. An entirely new bond formulation and reinforcement technique weld the wheel into a single, homogeneous unit, so rigid it virtually eliminates fluttering. It resists chipping, shattering or delaminating.



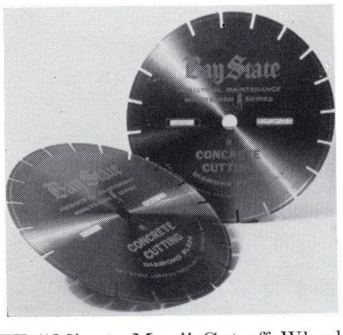
RUBBER (NON-REINFORCED)

Recommended for good finish, with a minimum of burn and burr, rubber bond is used mostly in wet cutting operations.



RESINOID (NON-REINFORCED)

Recommended for fast production and high wheel efficiency. Used most often in dry operations.



MINUTE-MAN PRODUCTS

There is a BAY STATE "Minute-Man" Cut-off Wheel for all kinds of masonry, refractory and concrete materials . . . Diamond blades and Reinforced resinoid cut-off wheels. Please refer to pages 66–67.

SEE NEXT PAGE FOR LISTINGS

Cut-Off Wheels

RECOMMENDED SPECIFICATIONS

Non-Reinforced

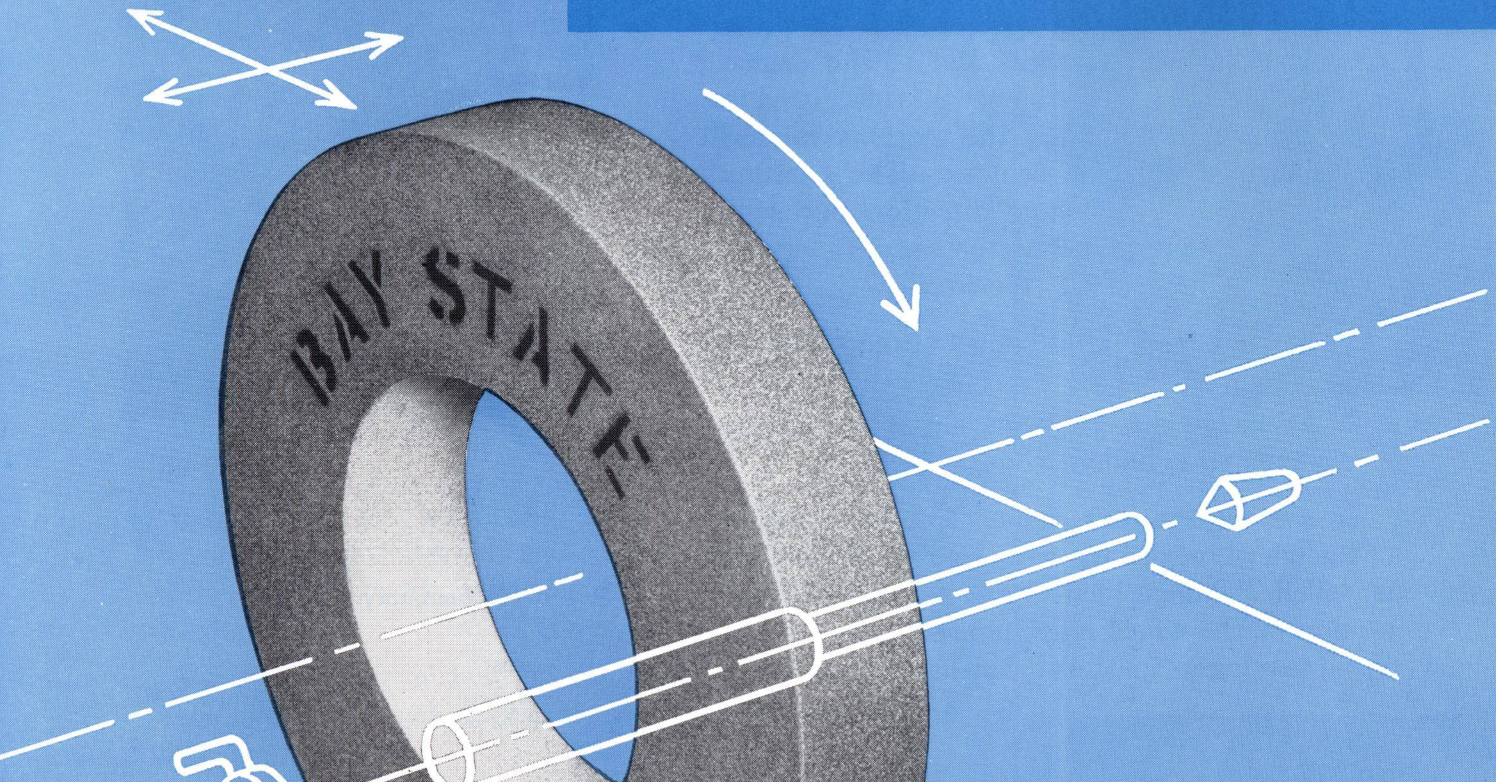
Type of Work	*Specification*
Agate (Wet)	D-80N2-M
Alnico (Wet)	A-80K0-R22
Aluminum Bars	A-24U6-R22
Aluminum Tubing	A-120T0-R22
Asbestos	C-24N8-BJ2
Bars (Dry) (Low Carbon) (Small)	A-304U6-BJ2
Bars (Dry) (Low Carbon) (Large)	A-304S6-BJ2
Bars (Dry) (Hardened and High Speed)	A-461P6-BJ2
Bars (Wet) (Slow Speed)	A-461R6-R22
Bars (Wet) (High Speed)	A-461T6-R22
Brake Linings (Dry)	C-30O6-BJ2RS
Brass (Wet)	A-60V8-R22
Brass (Dry)	A-30U6-BJ2
Brick (Portable Saw)	C-24P6-BJ2
Brick (Coping)	C-206Q4-BA2
Bronze (Hard)	A-24T6-R22
Carbon (Soft)	C-36O6-BJ2
Carbon (Hard)	C-46N6-BJ2
Cast Iron (Dry)	A-30Q6-BJ2
Cast Iron (Wet)	A-46T6-R22
Catalin (Dry)	C-60O6-BJ2
Catalin (Wet)	C-100R0-R22
Cemented Carbides (Wet)	D-100M4-B
Chilled Iron (Dry)	A-30Q6-BJ2
Chilled Iron (Wet)	A-461S4-R22
Clay (Block)	D-36N2-M
Concrete (Solid Wheel)	C-20Q6-BA2
Concrete (Diamond Wheel) (Wet)	D-46N1-M
Copper (Wet or Dry)	A-60V8-R22
Copper Tubing (Wet or Dry)	A-80Q6-R22
Drills (Manufacture—Dry)	A-46Q6-BJ2
Drills (Manufacture—Wet)	A-60T6-R22
Glass Tubing (Wet)	D-180N1-M
Granite (Wet)	C-24N6-BJ2
Diamond Wheel (Wet)	D-46N2-M
Knives (Machine—Dry)	A-46P6-BJ2
Knives (Machine—Wet)	A-54V6-RC2
Limestone	C-24P6-BJ2
Lucite	C-46N6-BJ2
Marble (Wet)	C-24P6-BJ2
Diamond Wheel (Wet)	D-46N2-M
Metallographic Specimens (Wet)	A-60M6-R22 A-60U6-RC2
Minerals—Lapidary (Wet)	D-46N1-M
Monel Metal (Dry)	A-36N6-BJ2
Monel Metal (Wet)	A-54X6-RC2
Nickel (Dry)	A-46Q6-BJ2
Nickel (Wet)	A-54X6-RC2
Pipe and Pipe Fittings (Dry)	A-304U6-BJ2RS
Pipe and Pipe Fittings (Wet)	A-36X6-RC2
Plaster Board (Celotex, Gypsum, Masonite)	C-24T6-BF2
Plastics (Dry)	C-46K6-BJ2
Plastics (Wet)	C-120L0-R22
Porcelain (Fired—Wet)	D-100N4-M
Porcelain (Refired—Dry)	C-46K6-BJ2
Rubber (Hard)	C-30M6-BJ2
Sand Cores	C-24R6-BJ2
Slate	C-24O6-BJ2
Steel (Hardened—Dry)	A-46N6-BJ2
Steel (Hardened—Wet)	A-60P6-R22
Steel (High Speed—Dry)	A-36O6-BJ2
Steel (High Speed—Wet)	A-461T6-R22
Steel (Soft—Dry)	A-304U6-BJ2RS
Steel (Soft—Wet)	A-36X6-RC2
Steel (Stainless—Free Machine—Dry)	A-36R6-BJ2
Steel (Stainless—Free Machine—Wet)	A-461X6-RC2
Steel (Tubing—Wet)	A-80U10-R22
Steel (Stainless Hard-Heat Treated—Dry)	A-46O6-BJ2
Steel (Stainless Hard-Heat Treated—Wet)	A-54X6-RC2
Stellite	A-60O6-BJ2
Terra Cotta	C-24P6-BJ2
Terra Cotta (Wet)	D-46N1-M
Tile	C-24O6-BJ2
Tile Diam. Blade (Wet)	D-46N1-M
Titanium	C-361O6-RC2PS
"Transite"	C-20P6-BJ2
Tubes (Steel—Finish not important—Dry)	A-301U6-BJ2
Tubes (Steel—Dry)	A-46R5-BJ2
Tubes (Steel—Wet)	A-80V10-R22
Tubes (Stainless—Wet)	A-80U10-R22
Tubing (Brass—Dry)	A-80V8-R22
Tubing (Brass—Wet)	A-100V8-R22
Tungsten Rods	A-120U8-R22
Valves (Automotive)	A-301U7-BJ2

Reinforced

	◁——Wheel Diameter——▷		
Material	*9″ and Under*	*10″ Through 16″*	*Over 16″*
Aluminum			
Small Sections	A24T6-BF2	A-241V6-BF2 A-24T-BH2	A-201V6-BF2 A-24T-BH2
Large Sections		A-201T6-BF2 A-24P-BH2	A-201V6-BF2 A-24P-BH2
Aluminum Bronze	A-201Q4-BF2	A-201Q6-BF2	A-201Q6-BF2
Bar Stock	A-241T6-BF2	A-241T6-BF2	A-241R14-BZ2AA
Small Sections	A-245T6-BF2	A-241R14-BZ2AA	A-241R14-BZ2AA
Brass	C-245R4-BF2	C-245R4-BF2 A-24V-BH2	C-241V10-BZ2AA A-24V-BH2
Bronze, All Types	A-24R4-BF2	A-201Q6-BF2	A-201V10-BZ2AA
BX Cable	A-54R6-BF2	A-54T6-BF2	A-54T6-BF2
Cast Iron	A-24U14-BY2	A-241R14-BZ2AA A-24P-BH2	A-201V10-BZ2AA A-24P-BH2
Channel Iron Small Sections	A-24U14-BY2	A-241R14-BZ2AA A-24R-BH2	A-241R14-BZ2AA A-24R-BH2
Copper	C-245T6-BF2	C-24T6-BF2	C-24T6-BF2
Corrugated Roofing	A-24T6-BF2	A-241R14-BZ2AA	A-241R14-BZ2AA
Malleable Iron	CA-201V10-BZ2AA	CA-201V10-BZ2AA	CA-201V10-BZ2AA
Monel	A-54P4-BF2	A-54R6-BF2 A-24P-BH2	A-54R6-BF2 A-24P-BH2
Nickel	A-24U14-BY2	A-241R14-BZ2AA	A-241R14-BZ2AA
NiHard	A-24P4-BF2	A-201Q6-BF2	A-201Q6-BF2
NiResist	A-24P4-BF2	A-201Q6-BF2	A-201Q6-BF2
Nodular Iron	A-24P4-BF2	A-201Q6-BF2	A-201Q6-BF2
Pipe			
Brass	C-36R4-BF2	C-241R14-BZ2AA	C-241R14-BZ2AA
Cast Iron	A-241U14-BY2	A-241R14-BZ2AA A-24P-BH2	A-201V10-BZ2AA A-24P-BH2
Steel	A241U14-BY2	A-241R14-BZ2AA	A-201V10-BZ2AA
Rails, Steel	A-241R14-BZ2AA	A-241R14-BZ2AA	A-241R14-BZ2AA
Rock Drills	A-24R6-BF2	A-24T6-BF2	A-24T6-BF2
Steel, Mild and			
Structural Shapes	A-24U14-BY2	A-241R14-BZ2AA	A-241R14-BZ2AA
Sheet	A-24U14-BY2	A-241R14-BZ2AA	A-241R14-BZ2AA
High Speed	A-54Q4-BF2	A-54Q6-BF2	A-54Q6-BF2
Stainless	A-54R4-BF2	A-54R6-BF2 A-24P-BH2	A-54R6-BF2 A-24P-BH2
Wrought Iron	A-24U14-BY2	A-241R14-BZ2AA	A-241R14-BZ2AA

BAY STATE ®
WHEELS of PROGRESS

Cylindrical GRINDING WHEELS



This type of grinding operation is that of removing stock from outside diameter of a cylindrical piece while it revolves on its axis between centers, or while held in a chuck.

BAY STATE ®
WHEELS of PROGRESS

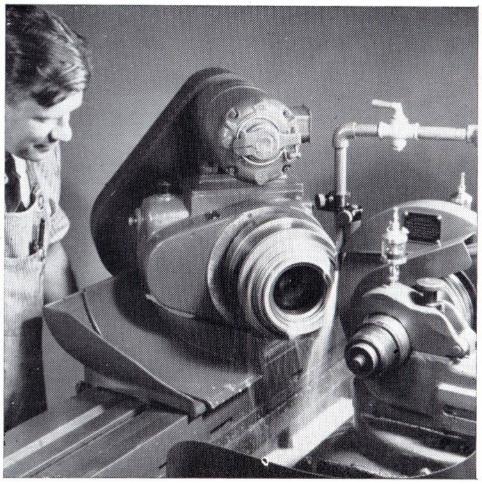
Cylindrical Grinding

From lathes, rolling mills, or dies, come straight or tapered cylindrical pieces. Cylindrical grinding finishes such pieces to exact size, within close tolerances and to the degree of finish specified.

In cylindrical grinding, the work is rotated at uniform speed upon centers. The grinding wheel rotates in the same direction but at a much higher speed, and at the same time may "traverse" (move along) the work:

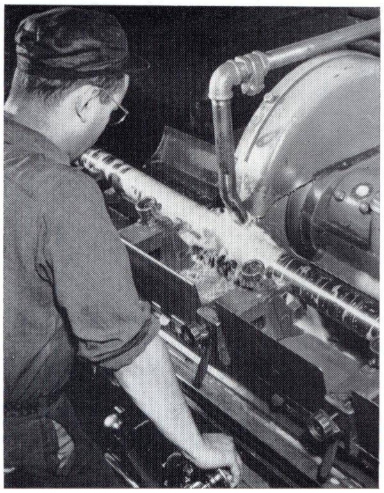
1. Parallel to the work's axis to produce a straight cylinder.
2. At an angle to the work's axis to produce a tapered cylinder.

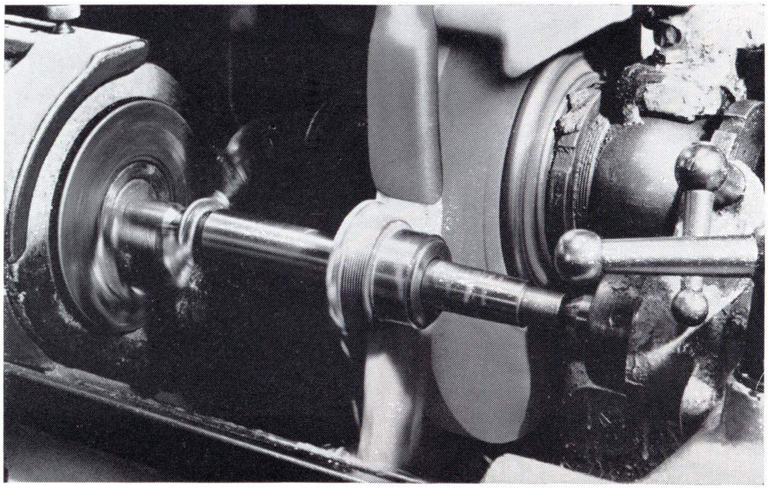
In some operations, only "Infeed" (motion of the wheel toward the work) is required. This is called "Plunge" cutting. A slight lateral motion of the wheel may be used, however, to avoid leaving a "pattern" on the work.



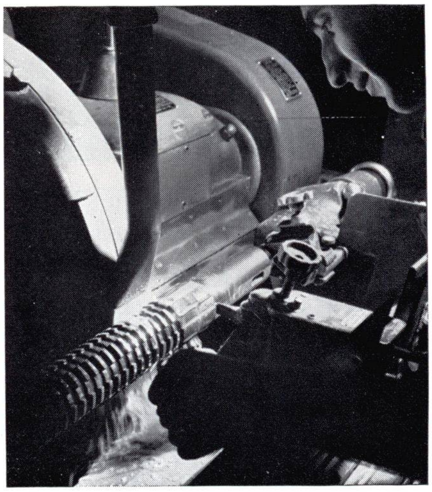
Commonly Used Sizes

O.D.	6–48″
Thickness	½–10″
Wheel Speed	5500–6500 S.F.P.M.
Work Speed	30–100 S.F.P.M.





Cylindrical Grinding Tips



1. A loaded wheel will ruin the finish. (Remedy—go softer, more open, and/or coarser.)
2. A slow traversing speed, light cut, or hard wheel results in a dulled, glazed wheel. (This method is sometimes used to give final finish on a part. It is called "sparking-out.")
3. A glazed wheel is a dull wheel. (A softer, more open wheel is the answer.)
4. A soft wheel is usually necessary in grinding hard materials.
5. With the work speed increased, the wheels can be harder.
6. Large diameter work and work requiring thicker wheels, require softer wheels. Conversely small diameter work and work requiring thin wheels, necessitate harder wheels.
7. Always balance a new wheel before mounting, to avoid possible machine vibrations with resulting surface chatter marks.
8. Tap the wheel lightly with the wooden handle of a screw driver. A clear ring indicates wheel is free from cracks.
9. Be sure to measure the work after the first cut has been made, to check against a possible taper.
10. Do not stop the revolution of the work until the wheel has been backed away.

Cylindrical grinding wheel shapes most commonly used are straight wheels and recessed either on one side or both sides. For grinding shoulders, however, it is more practical to use straight wheels relieved either one or two sides; or relieved one side and recessed the other side.

Cylindrical Grinding

RECOMMENDED SPECIFICATIONS

Material	*Specification*
Aluminum and Alloys	C-461K5-V32
Armatures (Laminations)	3A-36M5-V22
Axles (Auto)	3A-46M5-V22
Axles (Railway)	3A-46L5-V22
Bolts (Case Hardened)	3A-60M6-V22
Brass	C-361K5-V32
Bronze (Hard)	3A-46L5-V22
Bushings (Cast Iron)	C-461K5-V32
Bushings (Hardened Steel)	3A-60L6-V22
Cam Shaft Bearings (Automotive)	A-46N5-V22
Car Wheels (Chilled Iron) 6500 S.F.P.M. Maximum	C-20Q4-V32
Car Wheels (Chilled Iron) 9500 S.F.P.M. Maximum	C-20Q4-BA2
Car Wheels (Steel) 6500 S.F.P.M. Maximum	A-20P5-V22
Car Wheels (Steel) 9500 S.F.P.M. Maximum	A-20Q4-BA2
Car Wheels (Manganese)	A-16Q5-V22
Card Clothing 6500 S.F.P.M. Maximum	A-20Q5-V22
Card Clothing 9500 S.F.P.M. Maximum	A-20Q4-BA2
Cast Iron	C-361J5-V32
Catalin	C-461J5-V32
Cemented Carbide Roughing (Wet)	3C-60I8-V32
Cemented Carbide Roughing (Wet)	D-120L4-B
Cemented Carbide Finishing (Wet)	3C-120H9-V32
Cemented Carbide Finishing (Wet)	D-240L4-B
Chilled Iron	C-361K5-V32
Chromium Plate	
Commercial Finish	3A-80K7-V22
Good Commercial Finish	3A-180I8-V22
High Finish	A-320J9-BC2
Colmonoy	C-361I5-V32
Copper	C-120G9-V32
Cork	9A-46I12-V22
Crankshafts	See Note*
Drills (Manufacture)	3A-54N5-V22
Fiber	C-361K5-V32
Forgings	A-46M5-V22

*Note—The grinding of crankshafts or rolls is a highly specialized field. Ask for special assistance when selecting wheels for this type of work.

Material	*Specification*
Gauges—Plug (Roughing)	9A-80K7-V22
(Finishing)	9A-120J8-V22
(High Finish)	A-320J9-BA2
Gears (Hardened Steel)	3A-54J5-V22
Glass Gauges (Roughing)	1C-100H8-V32
(Semi-Finish)	1C-220H9-V32
(Final Finishing)	A-500H9-BA2
Glass Tubing	C-80H8-V32
Housings (Auto Axle)	A-46N5-V22
Motor Stators and Rotors	3A-36M5-V22
Pipe Balls (Manganese)	
(Roughing)	A-30Q5-V22
(Regrinding)	A-30N5-V22
Pistons (Aluminum)	C-461K5-V32
(Cast Iron)	C-361K5-V32
Piston Rings (Cast Iron or Semi-Steel Snagging)	C-241L5-V32
Piston Rods (Locomotive)	A-46M5-V22
Plastics (Heavy Stock Removal)	C-361L5-V32
(Light Stock Removal)	C-60J6-V32
Porcelain (Small Wheels)	D-100N4-M
(Large Wheels Roughing)	C-461J5-V32
(Finishing)	C-120H8-V32
(High Finish)	A-500H9-BA2
Pulleys (Cast Iron)	C-361J5-V32
Rifle Barrels	A-46M5-V22
Roller Bearing Cups	3A-46M5-V22
Rollers for Bearings (Large Rollers)	A-60L6-V22
Rolls	See Note*
Rubber (Soft)	C-14L4-BA2
(Medium)	C-241K4-BA2
(Hard)	C-361L4-BA2
Silver Plate	C-120J8-V32
Spline Shafts	3A-54N5-V22
Steel Castings (Boring Mill Types)	
6500 S.F.P.M.	A-24L5-V22
9500 S.F.P.M.	3A-16P4-BA2
Steel (Hardened)	3A-60K6-V22
(High Speed)	3A-60K6-V22
(Soft)	A-46M5-V22
(Stainless) (Free Machine)	C-361L5-V32
(Stainless Steel—Heat Treated)	3A-60K6-V22
Stellite	3A-46K5-V22
Titanium	8A-541K6-V22
Valves (Stems)	A-54N5-V22
Valve Tappets	A-46M5-V22

BAY STATE®
WHEELS of PROGRESS

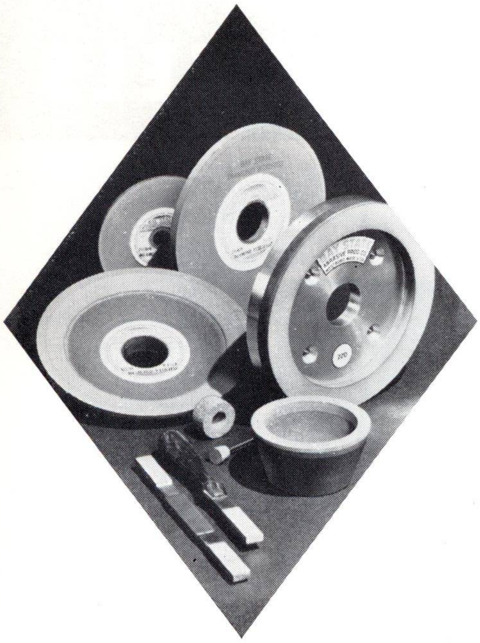
Diamond WHEELS

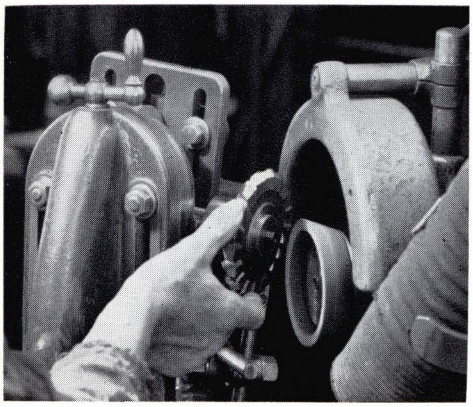
Diamond wheels are a special type of grinding wheel where the abrasive particles consist of diamond grit. The chief use of these products is for the grinding of the cemented carbides. However, a tremendous increase in usage is being found in the cutting of ceramic materials, marble, etc.

BAY STATE diamond wheels are available in two bond types: Resinoid and Metal.

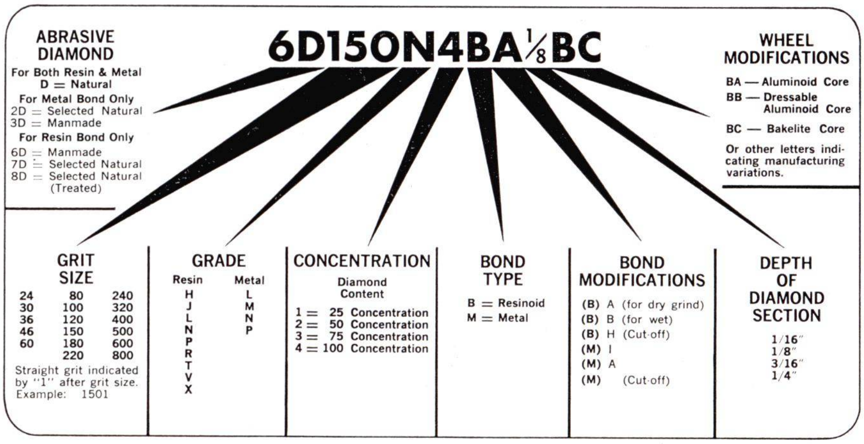
BAY STATE ®
WHEELS of PROGRESS

Diamond Wheels





THIS IS A VISUAL EXPLANATION OF A TYPICAL DIAMOND WHEEL MARKING



6D150N4BA⅛BC

ABRASIVE DIAMOND

For Both Resin & Metal
D = Natural
For Metal Bond Only
2D = Selected Natural
3D = Manmade
For Resin Bond Only
6D = Manmade
7D = Selected Natural
8D = Selected Natural (Treated)

WHEEL MODIFICATIONS

BA — Aluminoid Core
BB — Dressable Aluminoid Core
BC — Bakelite Core
Or other letters indicating manufacturing variations.

GRIT SIZE

24	**80**	**240**
30	**100**	**320**
36	**120**	**400**
46	**150**	**500**
60	**180**	**600**
	220	**800**

Straight grit indicated by "1" after grit size. Example: 1501

GRADE

Resin	Metal
H	L
J	M
L	N
N	P
P	
R	
T	
V	
X	

CONCENTRATION

Diamond Content
1 = 25 Concentration
2 = 50 Concentration
3 = 75 Concentration
4 = 100 Concentration

BOND TYPE

B = Resinoid
M = Metal

BOND MODIFICATIONS

(B) A (for dry grind)
(B) B (for wet)
(B) H (Cut-off)
(M) I
(M) A
(M) (Cut-off)

DEPTH OF DIAMOND SECTION

1/16″
1/8″
3/16″
1/4″

HAND HONES will be marked with grit size only as grade, concentration, bond type and depth have been standardized.

RESINOID

Very Fast Cutting

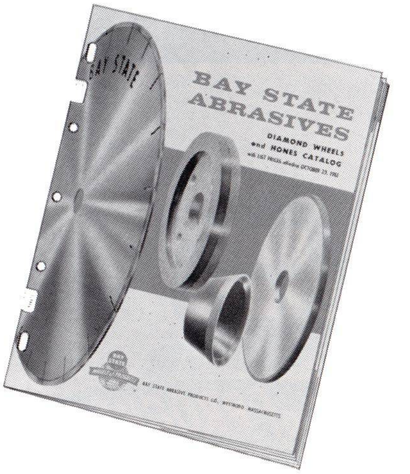
Resinoid wheels are the only ones suitable for dry tool grinding, where this is necessary. They give best results, however, when used wet. This type is also generally preferred for form grinding, where it is necessary to alter the shape of the face.

METAL

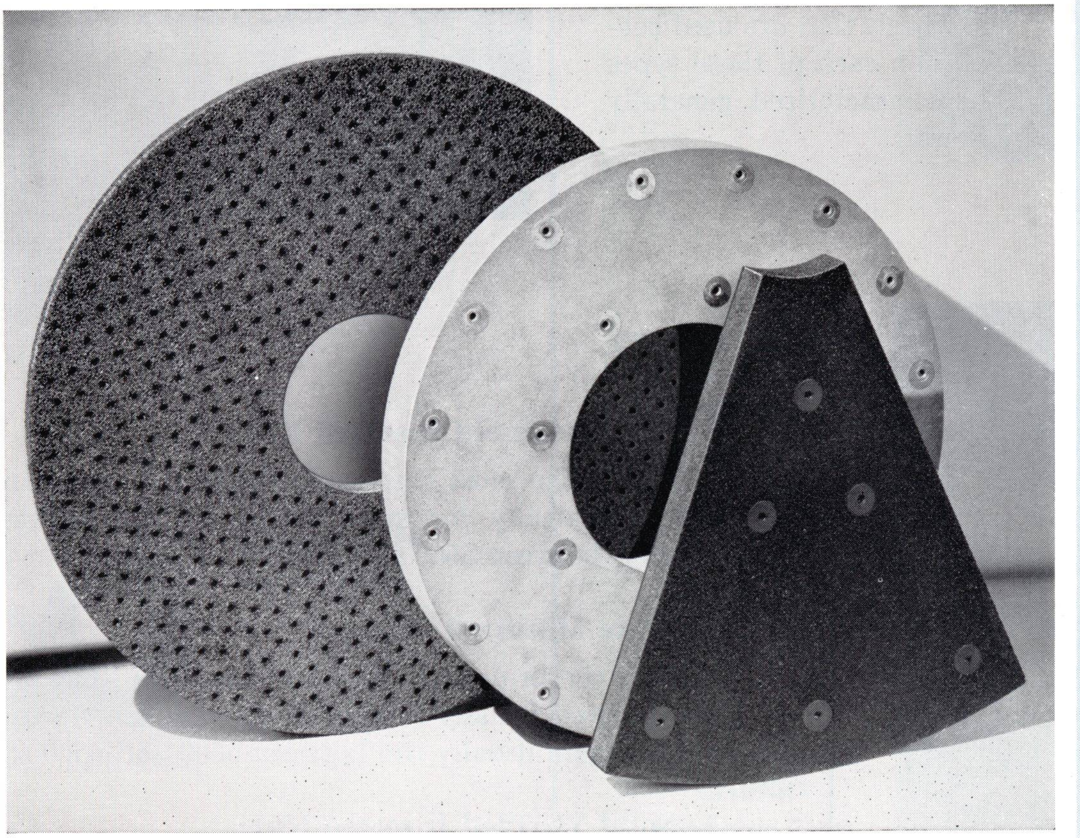
Extra Long Life

Metal bonded wheels, because of their qualities of durability and long life, are preferred by some users. On the whole, they are slower cutting than the resinoid type, but are widely used in the stone, glass, and masonry trades for cut-off operations.

Be Sure to Send for This Complete Catalog



Disc Grinding WHEELS

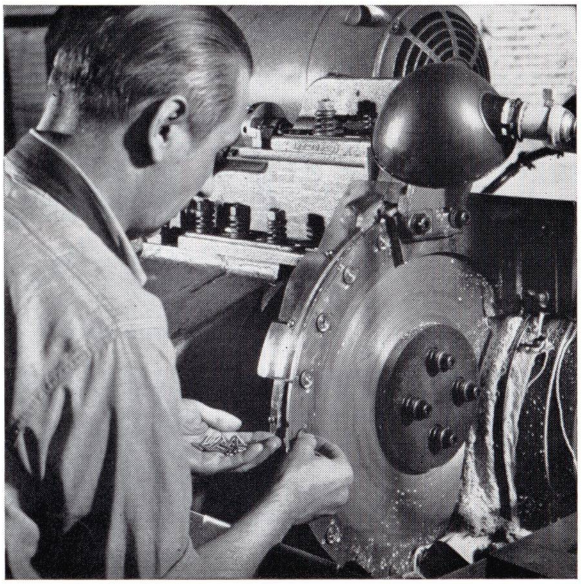


BAY STATE ®

WHEELS of PROGRESS

Disc and surface grinding are similar in that the grinding operation is done on flat surfaces. However, unlike surfacing machines, disc grinders are designed to give a high rate of production with only reasonable tolerance requirements.

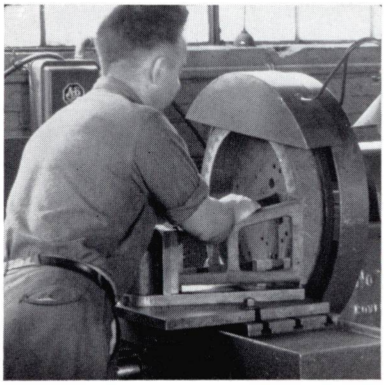
Disc Grinding



The three basic types of disc grinders are:

1. Horizontal Double-Spindle.
2. Horizontal Single-Spindle, double end and single end.
3. Vertical Spindle.

The wheels that are used successfully on each of these types can be characterized generally as follows:



1. Solid Resinoid Inserted Nut:

This is the most commonly used type, and can be used practically for any purpose. Usual operating speed is between 5500 and 6500 sfpm.

2. Plate Mounted Discs:

Both the projecting stud and the loose screw types can be used for any kind of disc grinding. Operating speeds again usually run between 5500 and 6500 sfpm.

3. Solid Vitrified Inserted Nut:

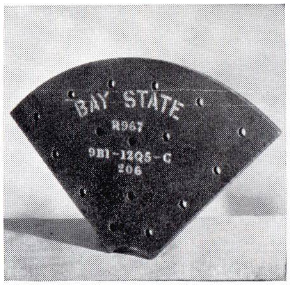
These discs should be used with light grinding pressures, and only on wet grinding jobs.

4. Cylinder Types:

There are two standard mountings for cylinder type discs. The nut-imbedded type is available in resinoid bond only. The protruding-stud type is available in either vitrified or resinoid bond.

BAY STATE ® WHEELS of PROGRESS

DISC GRINDING WHEELS



RESINOID SEGMENT TYPE

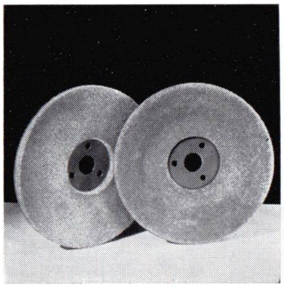
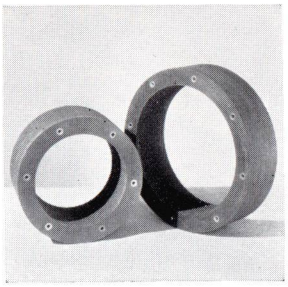


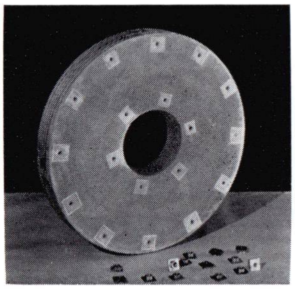
PLATE MOUNTED DISCS

(Loose Screw Type)



CYLINDER TYPE

(Inserted Nut)

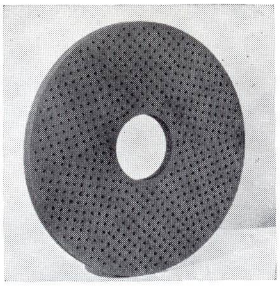


SOLID VITRIFIED

(Nut Imbedded)

PERFORATED DISC

(Resinoid)



RESINOID CYLINDER

(Studs—Perforated Steel Back)

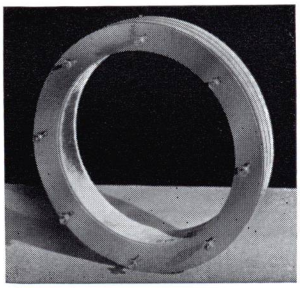
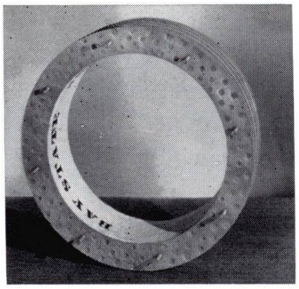


PLATE MOUNTED CYLINDER

(Projecting Screw Type)



Disc Grinding

Surfacing with disc wheels offers three distinct advantages over chuck-mounted ring wheels:

1. More abrasive surface area possible since disc diameter can be same as outside diameter of chuck.

2. Usable abrasive is almost 100%—no wasteful stubs to throw away as is the case with chuck-mounted wheels.

3. Less weight and overhang on spindles and bearings assures better balance and less vibration than with chuck mountings.

RECOMMENDED SPECIFICATIONS

Type of Work	*Specification*
Aluminum and Aluminum Alloys	C-24L4-BA2 #4 Treated
Brake Linings (Metal Filled)	
Roughing	7C-16J4-BA2
Finishing	7C-24L4-BA2
Brake Linings (Molded)	
Roughing	7C-16L4-BA2
Finishing	7C-24M4-BA2
Brass	C-20L4-BA2 #4 Treated
Brick (Vitrified)	
Hard Brick	C-14M4-BA2
Firebrick	C-16Q4-BA2
Bronze (Hard)	3A-16K4-BA2
Carbon	C-36M4-BA2
Cast Iron (Large Castings)	C-16L4-BA2
(Small Castings)	C-20K4-BA2
Connecting Rods	3A-24M4-BA2
Copper (Copper Alloys)	C-36M5-BA2
Dies—Drawing	3A-46J5-BA2
Fiber	C-14K4-BA2
Forgings	3A-16L4-BA2
Gears (Hardened Steel)	3A-24K4-BA2
Housings (Auto Axle)	3A-20M4-BA2
Malleable Iron (Annealed)	3A-16L4-BA2
Malleable Iron (Unannealed)	C-16M4-BA2

Type of Work	*Specification*
Pipe and Pipe Fittings	
Surfacing—Discs	
Fittings—Brass	C-20L4-BA2
Fittings—Cast Iron	C-16K4-BA2
Fittings—Steel	3A-16L4-BA2
Piston Pins (Surfacing Ends)	A-60L6-BA2
Piston Rings (Cast Iron or Semi-Steel)	
Surfacing—Discs (Parallel)	
Roughing	C-241L3-BA2
Semi-Finishing	C-46L5-BA2
Finishing	C-70M6-BA2
Plastics	C-36J4-BA2
Porcelain	C-30K4-BA2
Rails—Surfacing	
Surfacing (Welds)	
Portable Grinders (Disc)	A-16M4-BA2
Rawhide	C-14L4-BA2
Sad Irons	C-16L4-BA2
Sand Cores	C-20L4-BA2
Steel (Hardened)	3A-30K4-BA2
Steel (High Speed)	3A-46J5-BA2
Steel (Soft)	3A-16M4-BA2
Stove Parts (Cast Iron)	
Surfacing—Miscellaneous Parts	
Discs	C-16L4-BA2
Terra Cotta	C-20M4-BA2
Valves (Surfacing Ends)	3A-36J4-BA2
Wrenches	A-20L4-BA2

GRITCLOTH®

U. S. PATENT NOS. 2.740.239 AND 2.740.725

TOMORROW'S SANDING FABRIC, TODAY!

GRITCLOTH is the first open mesh sanding fabric, with abrasive on both sides. Non-clogging, it gives up to 15 times the life of coated abrasive papers or cloths.

BAY STATE ®
WHEELS of PROGRESS

BAY STATE ABRASIVE PRODUCTS CO.
Westboro, Massachusetts, U. S. A.

Gritcloth

10 to 15 TIMES LONGER LIFE than the conventional types of coated abrasives

APPLICATIONS ARE LIMITLESS . . . each day finds a new successful operation for this modern, Miracle Sanding Fabric

NON-LOADING . . . OPEN MESH LETS THE REMOVED PARTICLES FLOW RIGHT THROUGH

THOUSANDS OF SUPER-SHARP EDGES KEEP ON CUTTING

Once and for all. GRITCLOTH solves the age-old problem of clogging sandpaper and other types of coated papers. GRITCLOTH'S revolutionary open-mesh design lets the removed particles flow right through, and the sharp abrasive teeth keep right on cutting. Actual tests show 10 to 15 times the life of ordinary coated papers.

Tomorrow's Sanding Fabric Today!

GRITCLOTH AVAILABILITY

ABRASIVE TYPE	GRIT SIZE											
A (ALUMINUM OXIDE)	100	120	150	180	220	240	280	320	360	400		
C (SILICON CARBIDE)	100	120	150	180	220	240	280	320	360	400	500	600

NOTE: GRITCLOTH is available in the above Abrasive Types and Grit Sizes in sizes of any length and up to 27″ wide.

STANDARD SHAPES AND SIZES

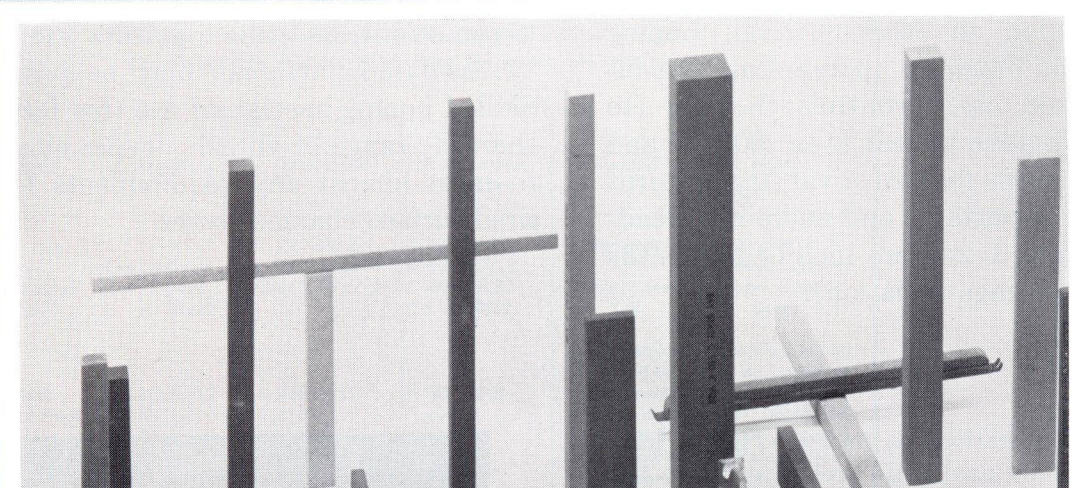
SHAPE	SIZES	ABRASIVE TYPE AND GRIT SIZE
SHEETS	9 x 11	A 100 thru 400 and C 100 thru 600
	3⅔ x 9	A 100, 150, 320, 360, 400 and C 100, 150, 220, 280, 320, 400
ROLLS	1″ x 25 yd.	A 100, 150, 320, 400 and C 100, 150, 220, 280, 320, 400
	2″ x 25 yd.	A 100, 150, 320, 400 and C 100, 150, 220, 280, 320, 400
DISCS	8″ dia x ⅞″ hole	A 100, 150, 320, 400 and C 100, 150, 220, 280, 320, 400
	8″ dia x no hole	A 320, 360, 400
	16″ dia x no hole	C 150
	20″ dia x no hole	C 150

USES	
SHEETS	9 x 11 SHEETS are used for such hand work as woodworking, removing rust, etc. . . . 3⅔ x 9 SHEETS are specifically made for reciprocating sanders or "Jitterbugs" for use in paint removal and blending . . .
ROLLS	sections from GRITCLOTH ROLLS may be torn off and used, one at a time or several layers thick, for the many sanding jobs that would load a coated abrasive disc . . .
DISCS	8″x no hole DISCS are used for Wet Deck Sanding of the primer paint coat throughout the Automotive Industry . . . 16″ and 20″ dia x no hole C150 DISCS are used for finishing new floors or removing build-up and refinishing older floors. . . .

GRITCLOTH is used for finishing jobs on wood or metal, dry or wet, flat or folded, by machine or hand, both sides.

Send for Sample

Honing & Refined Surface Finishing



Today, with the advancement made in abrasive honing and refined-surface-finishing stones and tools, it is possible to rough and finish to an extremely high degree of surface finish (to within micro inches). This applies to practically all types of material such as non-ferrous metals (brass, bronze, aluminum, etc.); also hard and soft steel, as well as cast and centrifugally cast iron.

BAY STATE ®
WHEELS of PROGRESS

Honing

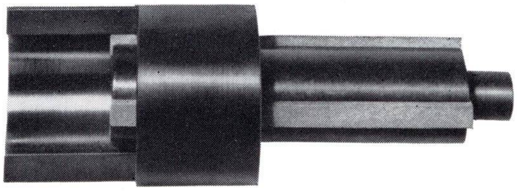
Although the usual concept of honing is that of a process for obtaining high degrees of finish, present-day honing processes are important as stock-removing processes. Some honing operations remove up to .040″ or .050″ of stock, but the usual stock left for honing runs about .0010″ to .0015″ per inch of bore diameter plus extra allowances for out-of-round, tapered or extra long bores.

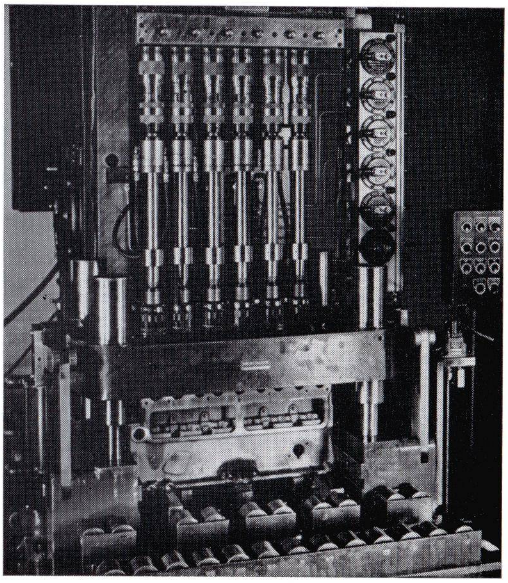
In addition to stock-removal, honing corrects the *geometry* (parallelism, out-of-round, taper, etc.), controls the *size* (to within tolerances of less than .0001″) and produces *surface finishes* or varying patterns (which are important) and micro-inch readings (down to 1–2 micro inch or millionths of an inch average variation).

The small honing stones (or "sticks") are held somewhat loosely in a full-floating frame, and pressed lightly against the cylinder walls by hydraulic, mechanical, or spring pressure. In operation, this whole assembly is reciprocated back and forth through the cylinder to be honed. At the same time, it is given rotary motion also.

By varying the relative speeds of these two motions, an almost infinite variety of "cross-hatch patterns" may be produced. Skilled honing specialists use this fact, and the wide range of abrasive types available, to meet almost any requirements for desired surface characteristics.

Horizontal operations, as illustrated below, have been successfully used with strokes up to 70 feet and diameters of bore up to 50 inches.

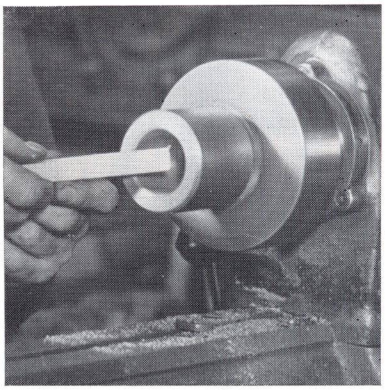




Finish, stone life, and stock removal are controlled by rotary speed of honing, this speed ranging up to 500 sfpm. Reciprocating speeds (stroke) range up to 100 fpm in most instances and control mainly the cross-hatch pattern produced.

BAY STATE
WHEELS of PROGRESS

Due to the great variety of honing applications, it is impossible to set up a definite abrasive chart covering all materials to be honed. However, this chart may be used as a general working guide.



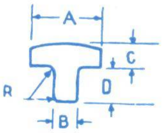
Suggested Stone Recommendations for Internal Honing

Because of the different types of tools being used today it might be necessary to deviate slightly from the shown specifications.

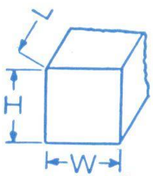
Material	*Roughing*	*Semi-Finish*	*Finish 8 Micro-Inch or Better*	*Coolant*	*Notes*
Cast Iron or Malleable Iron	C-120-MVL2 C-120-KVL2 C-150-LVL2 C-150-MVL2	C-220-JVL2 C-220-KVL2 C-240-KVL2	C-320-HVL2 C-400-GVL2 C-400-IVL2 C-500-HVL2	Kerosene or Mineral Seal Oil	Grain size to be selected depends on type finish desired.
Steel Mild or Heat Treated Forgings	A-120-MVL2 #10 A-150-MVL2 #10	A-280-JVL2 #10 A-320-JVL2 #10	C-500-IVLB #10	Sinclair Union Base Oil or Equivalent and Kerosene 1 part U.B. 2 to 4 parts Kerosene	Some steel tubing can be honed as it is received from the mill without previous machining operations.
Steel Hardened over 50° Rockwell Chrome Plate	A-220-IVL2 A-280-FVL2 A-280-KVL2	A-320-IVLG2 A-320-JVLB	C-500-GVL2 C-500-HVL2	Sinclair Union Base Oil or Equivalent and Kerosene 1 part U.B. 2 to 4 parts Kerosene	Some chrome plate such as channel or porous chrome use one grade harder stone than shown.
Non-Ferrous Bronze, Aluminum, Etc.	A-220-JVL2 A-220-KVL2	A-320-IVLB A-320-JVLB	C-500L5-B60C C-500M5-B60C	Sinclair Union Base Oil or Equivalent and Kerosene 1 part U.B. 2 to 4 parts Kerosene	A very high degree of finish can be obtained on non-ferrous metal by using specification shown.
Iron or Steel Hydraulic Valve Cylinders or Interrupted Bores	A-180-QB2B A-180-RB2B		A-320-PB2B A-320-QB2B	Iron, Kerosene Steel—U.B. and Kerosene	Because of the particular condition of this type bore the specification shown has been very successful.

NOTE: Bores with keyways, ports or other openings ordinarily would require a harder grade stone than shown above. Upon request, and with detailed information given as to material to be honed, type of tool used, stock removal and finish desired, we would be glad to submit further abrasive recommendations for machine or hand honing.

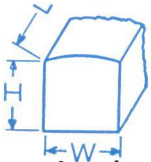
STANDARD SHAPES



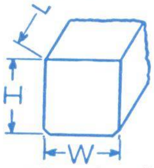
T-Shape



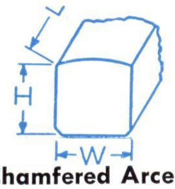
Rectangular



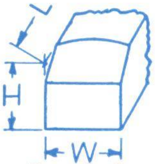
Arced



Chamfered



Chamfered Arced

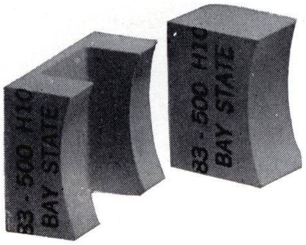


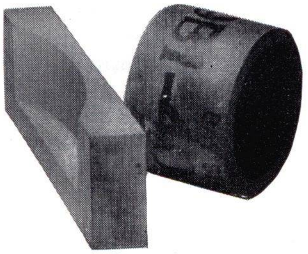
Beveled

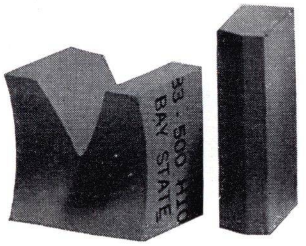
REFINED SURFACE FINISHING

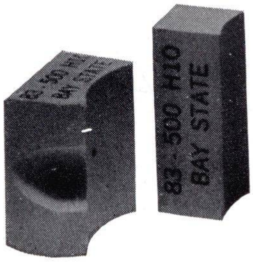
These wheels and stones are used on roller bearing races, crankshaft pins and bearings, camshaft and cam contours, airplane bearings, pistons, piston pins, valve tappet heads, valve stems, brake drums and shoes. Similar success with this new type of finishing is being obtained on hardened steel rolls, plug gages, surface plates and differential gear faces.

Every stone is carefully graded by means of Rockwell Hardness Testers, assuring exact duplication.





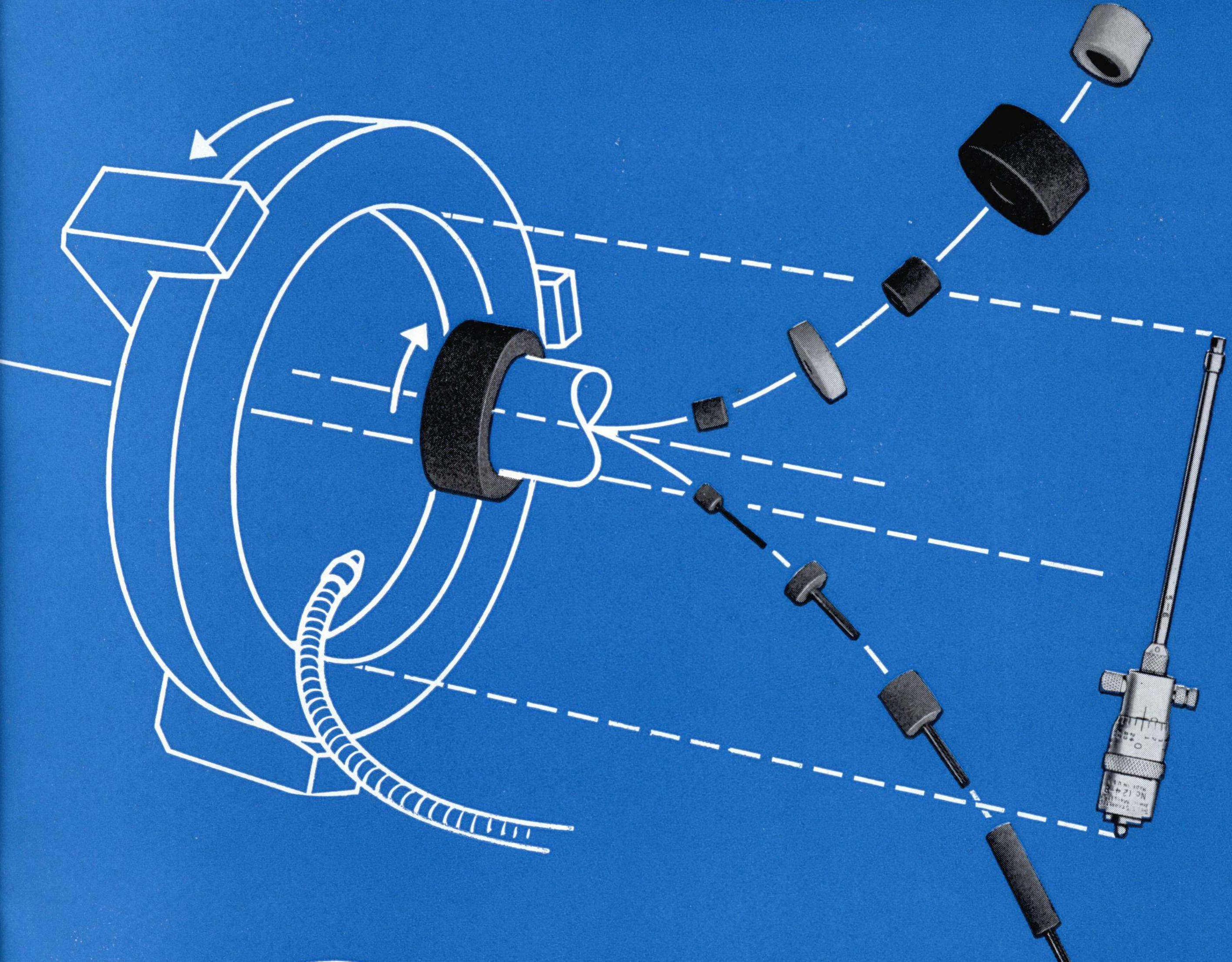




GENERAL SPECIFICATIONS

Part	*Specification*	*Finish Micro-Inches*
Pistons (Aluminum Alloy)	C-500K7-BA2	5–8
Tappet Barrels (Steel)	A-600C-VG2	2–4
Tappet Heads (Steel)	C-280N8-BA2 C-320O8-BA2 C-400O8-BA2	1–2
Brake Drum (Iron)	C-180J-VL2	(Roughing Oper.)
	C-180K-VL2	(Roughing Oper.)
	C-400K-VL2	8–12
	C-320K-VL2	8–12
Distributor Shafts (Steel)	A-600J-VG2	4–6
Marine Engine Wrist Pins (Steel)	A-600F-VG2	2–3
Pinion (Steel) Bearings	A-320J10-V82K	3–4
Aircraft Bearing Shells (Steel)	A-600H-VG2	1–3
Drills and Reamers (Steel)	A-500G-VG2	1–2
Crankshafts (Forgings)	A-500G-VG2 A-500I-VG2 A-600H-VG2	2–4
Clutch Plates (Iron)	C-150I-VL2	(Roughing Oper.)
	C-400K10-VM2	5–10
Valve Stems (Steel)	A-500L8-BA2 A-600L8-BA2	2–4
Camshaft Bearings (Forgings)	C-500I10-VM2	3–5

Internal GRINDING WHEELS



BAY STATE®

WHEELS of PROGRESS

The grinding of internal surfaces of holes (inside diameters) is termed internal grinding. The holes may be straight cylindrical, tapered, straight and tapered, or formed. The grinding is done on the outside diameter of straight wheels, or modifications of straight wheels.

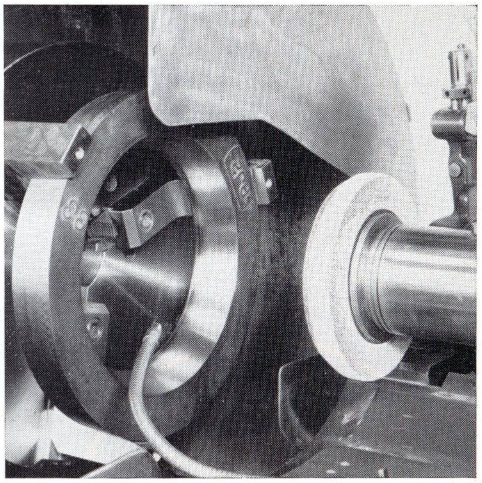
Internal Grinding

Cylindrical openings may be drilled or bored into metal parts. Often, these are subsequently heat-treated, involving the possibility of distortion. In any case, grinding is called upon to produce the final size, finish, concentricity, and exact positioning of such openings.

In internal grinding, the work cannot be mounted on centers. Instead, it is held in a suitable chuck, or between rolls (centerless) and rotated at uniform speed about the axis of the desired opening.

The grinding wheel, necessarily relatively small, rotates at high speed in the opposite direction. At the same time, it may "traverse" (be moved back and forth along) the inner surface of the machined opening.

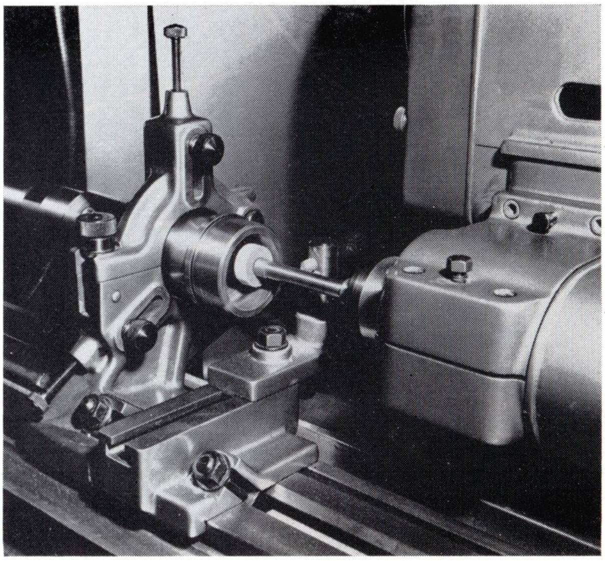
Of necessity in internal grinding, the area of contact between wheel and work is large, and spindle diameters small. These facts limit the rate of stock removal somewhat, and make it a critical factor to tooling and production engineers.

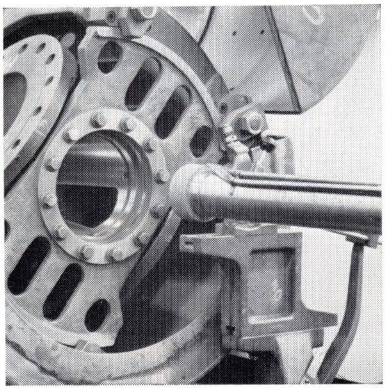


COMMONLY USED SIZES

O.D.	⅛″–7″
Speed	6500 sfpm maximum

Note: Spindle speeds up to 100,000 rpm.





RECOMMENDATIONS

1. Keep the wheel as close to the spindle bearings as possible when grinding holes 2″ and larger in diameter, to allow for increased wheel weight and increased grinding pressures resulting from larger wheels.

2. When grinding small holes, increase the quill or spindle speed. Most efficient speeds range from 2000 to 6000 sfpm.

3. Constantly check the operating condition of the spindle. Even the slightest vibration will cause excessive wheel wear.

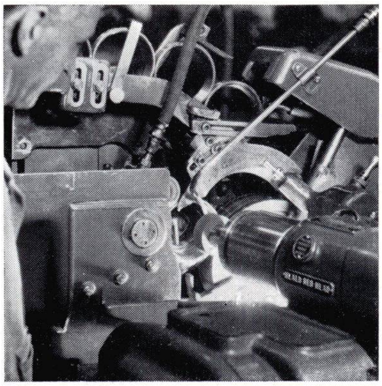
4. In the use of quills, make certain to select the correct pulleys for variable wheel diameters to assure proper wheel speeds.

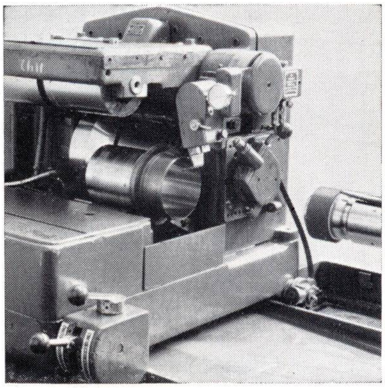
5. Considerable care should be given to the chucking fixture for holding the work to be ground.

6. Always true the wheel face before grinding, to guarantee alignment and balance.

7. Fractional grades are extremely important inasmuch as they permit a much closer "fit" of wheel to the work to be accomplished.

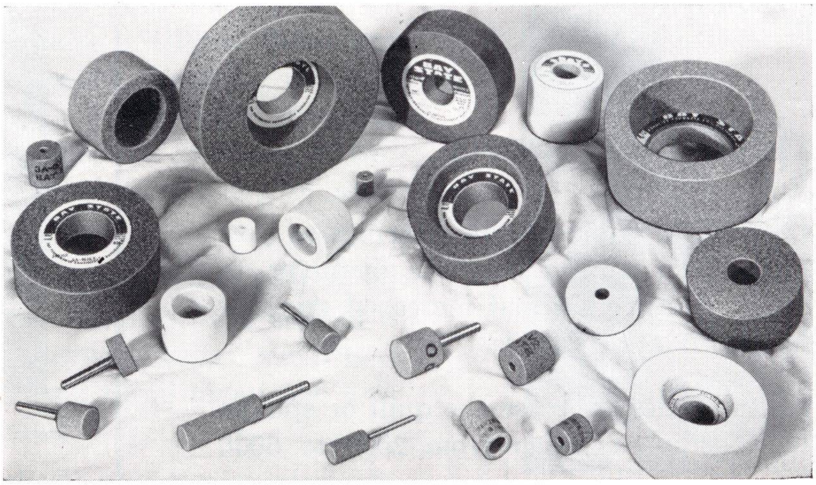
8. For the most accurate results, great care must be taken to determine the proper grit and grade of all internal wheels. These may be determined by trials.





BAY STATE ® WHEELS of PROGRESS

Internal Grinding

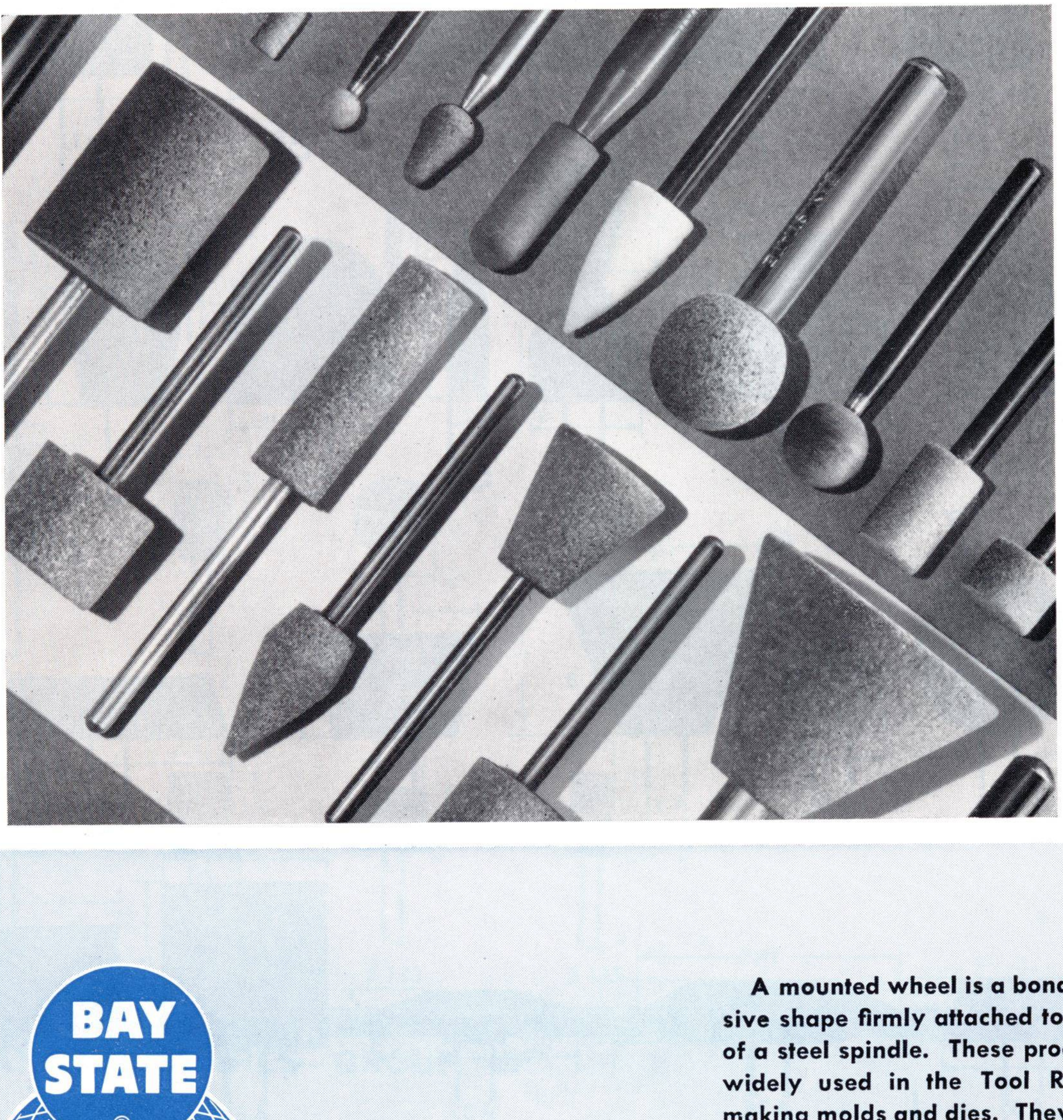


RECOMMENDED SPECIFICATIONS

Type of Work	*Specification*
Aluminum and Aluminum Alloys	C-361K5-V32
Ball Races—Radial (Hardened Steel) Bores	6A-80L7-V22
Brass	C-361J5-V32
Bronze (Hard)	6A-60K6-V22
Bushings (Cast Iron)	C-461J5-V32
Bushings (Hardened Steel)	6A-60K5-V22
Cast Iron	C-461J5-V32
Chromium Plate	9A-60J6-V72
Colmonoy	C-60I6-V32
Connecting Rods	6A-60K6-V22
Cylinders—Automotive (Cast Iron) Regrind	C-361H8-V32
Cylinders—Aircraft Molybdenum Steel	9A-54J5-V22
Forgings	3A-60K6-V22
Gears (Hardened Steel)	6A-60J6-V22
Glass Gauges	D-100N4-M
Glass Tubing	D-100N4-M
Motor Stators and Rotors	3A-46K5-V22
Nitrided Steel	C-60H6-V32
Piston Rings (Cast Iron or Semi-Steel) Snagging	C-36S5-V32
Plastics	C-60H5-V32
Roller Bearing Cups	6A-70N6-V22
Steel Castings (Manganese) Slow Speed	A-20P5-V22
Steel Castings (Manganese) High Speed	3A-24Q4-BA2
Steel (Hardened)	9A-60J6-V22
Steel (High Speed)	9A-60J6-V22
Steel (Soft)	3A-46M5-V22
Steel (Stainless; Free Machine)	C-361K5-V32
Steel (Stainless; Hard, Heat-Treated)	6A-60K6-V22

BAY STATE®
WHEELS of PROGRESS

Mounted Wheels

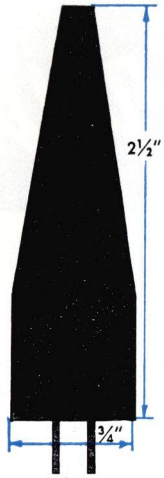


A mounted wheel is a bonded abrasive shape firmly attached to one end of a steel spindle. These products are widely used in the Tool Room for making molds and dies. They are also used quite extensively in foundries for grinding difficult-to-reach spots on castings, metal patterns, etc.

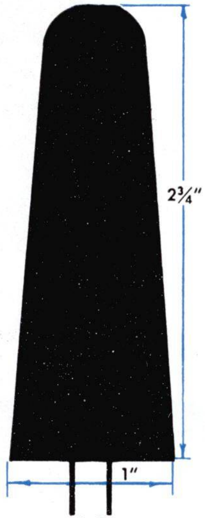
BAY STATE ®
WHEELS of PROGRESS

Mounted Wheels

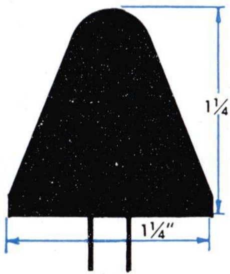
STANDARD SHAPES—GROUP "A"



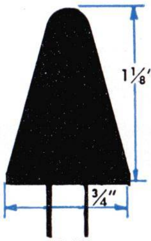
A 1



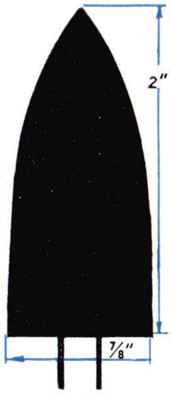
A 3



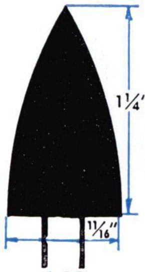
A 4



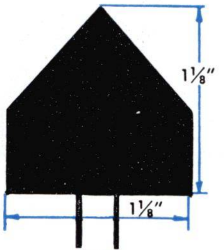
A 5



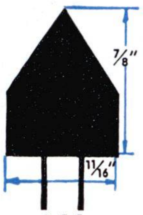
A 11



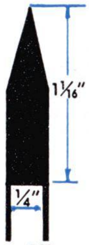
A 12



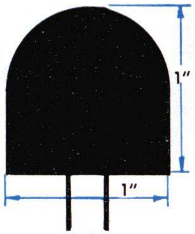
A 13



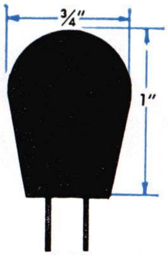
A 14



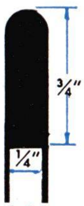
A 15



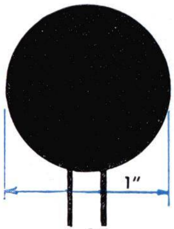
A 21



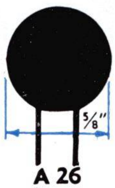
A 23



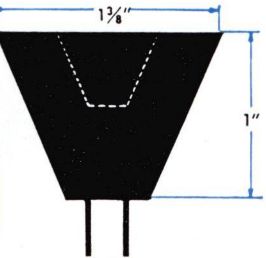
A 24



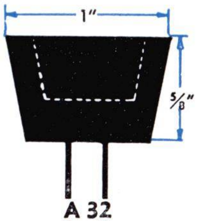
A 25



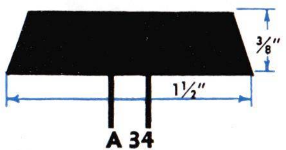
A 26



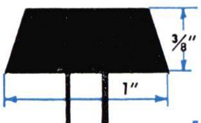
A 31



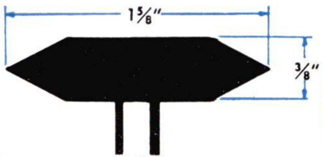
A 32



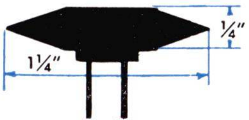
A 34



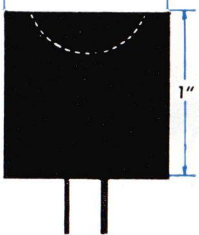
A 35



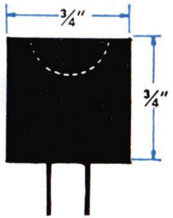
A 36



A 37



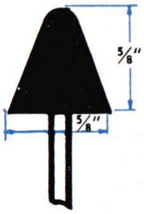
A 38



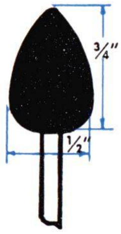
A 39

BAY STATE
WHEELS of PROGRESS

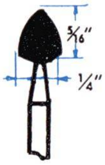
STANDARD SHAPES—GROUP "B"



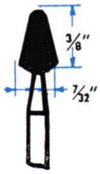
B 41



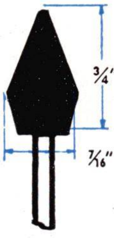
B 42



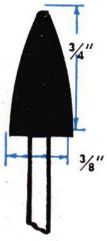
B 43



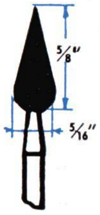
B 44



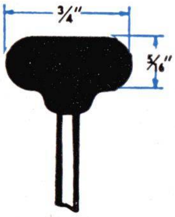
B 51



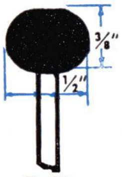
B52



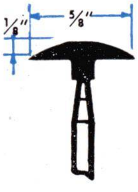
B53



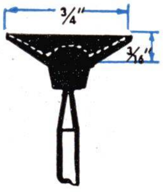
B 61



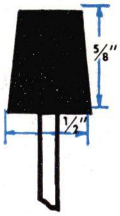
B 62



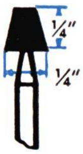
B 71



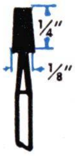
B 81



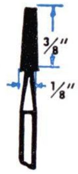
B 91



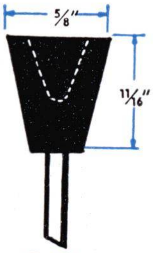
B 92



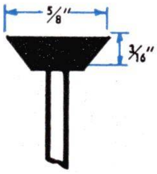
B96



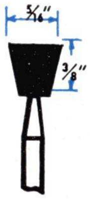
B 97



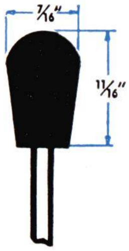
B 101



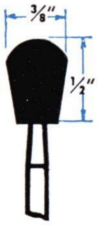
B 103



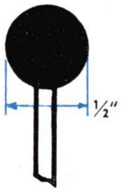
B 104



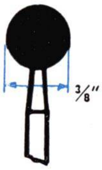
B 111



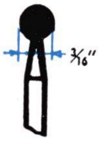
B 112



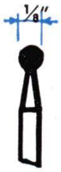
B 121



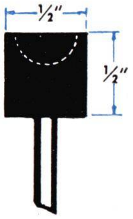
B 122



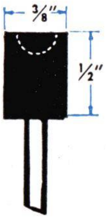
B 123



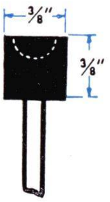
B 124



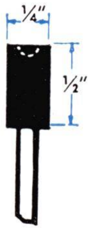
B 131



B 132

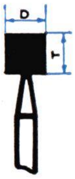


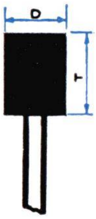
B 133

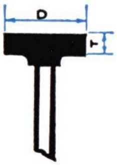


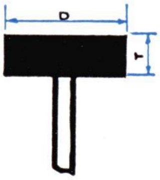
B 135

STANDARD SHAPES—GROUP "W"









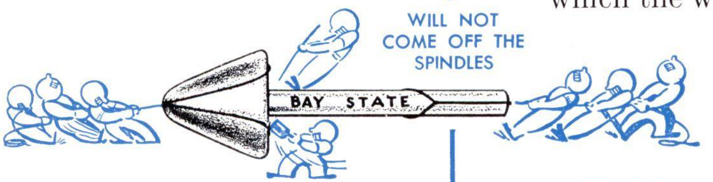
BAY STATE
WHEELS of PROGRESS

Mounted Wheels

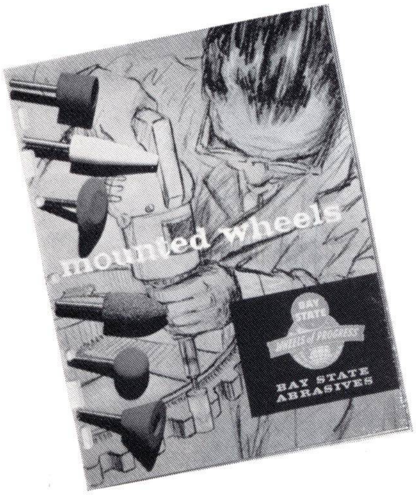
Bay State manufactures mounted wheels in all the standard shapes and in a wide range of straight dimensions. There is a shape and size to meet your job requirements. In addition, there are thousands of specification possibilities. Grit type, grit size, grade (hardness), structure and bond, all are variable to meet the endless variety of industrial uses.

Outstanding records of achievement and dependability have been established by Bay State mounted wheels. This product has become indispensable to industry, not only for portable die grinding and snagging operations but also for precision internal grinding. Small wheels for internal grinding, ¼″ diameter and under, are now being used at speeds as high as 100,000 RPM on high frequency electric wheelheads.

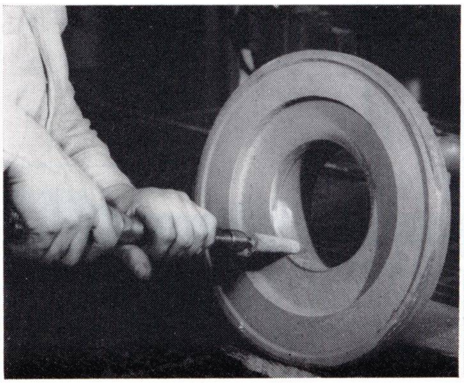
The standard spindle for Bay State mounted wheels is made of stainless steel and is deeply knurled at the end to which the wheel is attached for strong permanent mounting.


WILL NOT COME OFF THE SPINDLES
BAY STATE

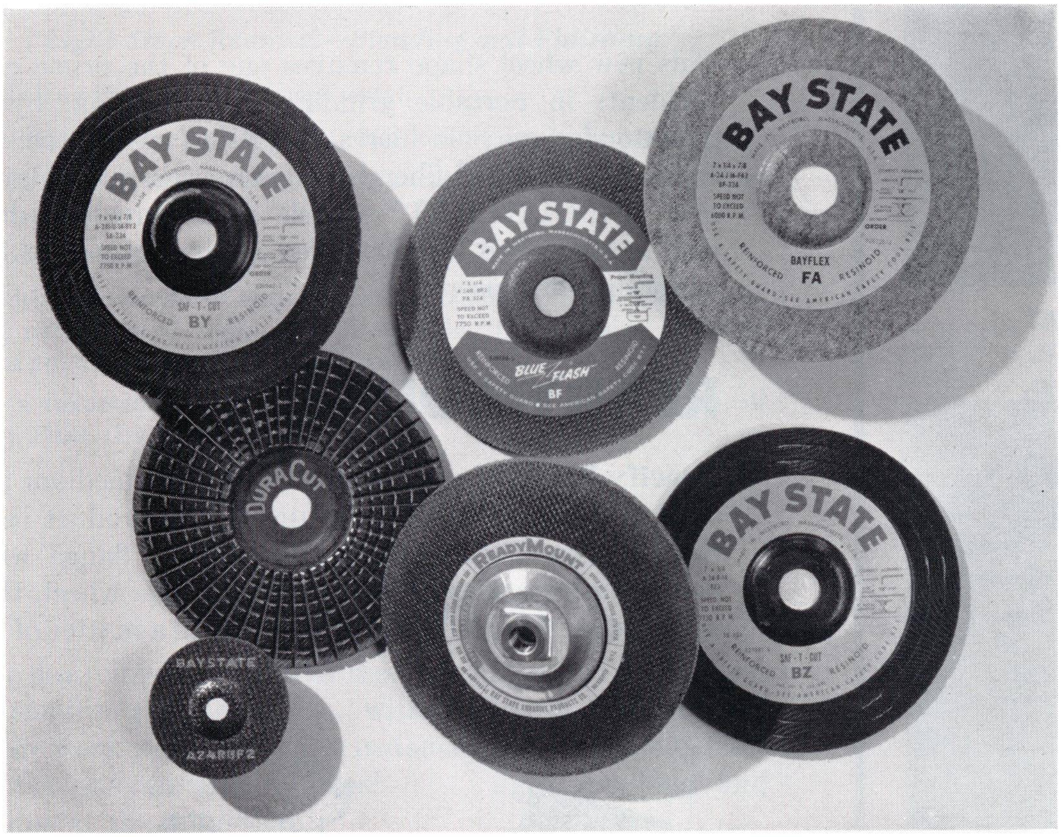
Positive adhesion of the wheel to the spindle is assured through a unique method of testing. Representative samples of the wheels are constantly checked by securing the spindle in a vice, gripping the wheel with a wrench, and twisting the spindle by rotating the wheel a full turn, thus subjecting the wheel and spindle to a far greater stress than would ever be required under actual operating conditions.



For complete details ask for the Bay State "Mounted Wheels" catalog.



Reinforced Raised Hub
DISC-WHEELS



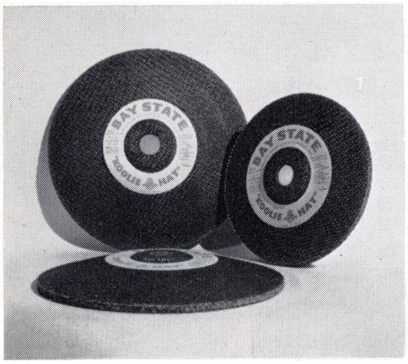
BAY STATE ® WHEELS of PROGRESS

STRENGTH AND SAFETY make reinforced resinoid products ideal for fast stock-removal in Welding, Snagging, Deburring, and Finishing.

Reinforced Raised Hub Disc-Wheels

BAY STATE reinforced resinoid products have tough, resilient strength because their abrasive grains are held with special bonds to laminations or loops of strong, synthetic fibers.

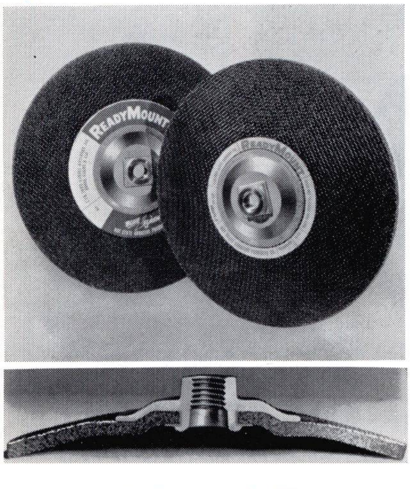
This construction provides the same fast, sharp cutting qualities of conventional resinoid snagging wheels, yet at the same time provides lighter-weight, safe, breakage-resistant abrasive tools.



KOOLIE HAT

KOOLIE HAT®

This new wheel shape removes one of the prime causes of accidents in portable grinding and blending, by cutting operator-fatigue. It increases cutting speed, too. Triple-layer, resin-bonded fiberglas construction gives Bay State's new "KOOLIE HAT" wheels extra strength, durability and a controlled contact area so important to portable snagging wheel users.



READYMOUNT

READYMOUNT

Specify ReadyMount RM for nearly all medium to heavy weld grinding jobs. The feature of this product lies in the combination mounting-nut and back-up flange which becomes an integral part of the wheel. The wheel, therefore, screws directly onto the grinder shaft, in a matter of seconds.

REINFORCED RESINOID PRODUCTS

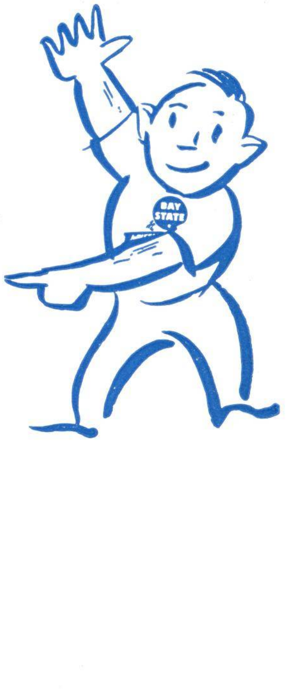
BAY STATE WHEELS of PROGRESS

Raised Hub Disc-Wheels

Cut-Off Wheels

Straight Wheels

BAY STATE ABRASIVE PRODUCTS CO. WESTBORO, MASS.



GET THE LATEST FACT-FILLED COMPLETE CATALOG

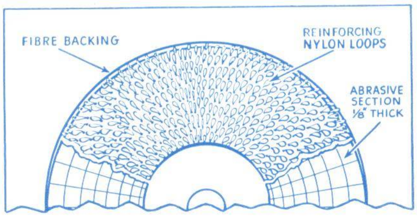
DURACUT®

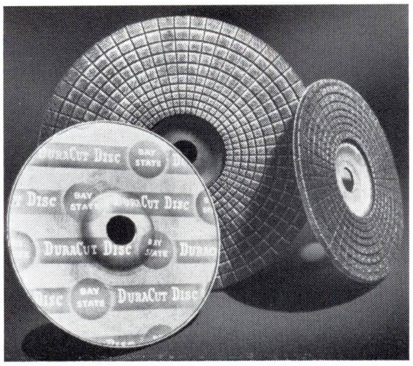
DuraCut's multi-layer construction gives a full $\frac{1}{8}$-inch of abrasive thickness on its flexible cutting face. It replaces the conventional single-layer sanding discs on many applications, and when properly used outlasts these by from 10 to 25 times.

TYPICAL APPLICATIONS

Light Stock Removal—Blending and Finishing

1. Finishing light welds on sheet metal.
2. Automotive, truck, railroad car and locomotive body work.
3. Sink, refrigerator, stove, metal furniture, and metal cabinet manufacture.
4. Moderate contour work.
5. Finishing concrete or cement ceilings, columns, walls, sills, floors, and natural stone slabs. Silicon carbide "C" abrasive DuraCut discs are used for grinding these materials.
6. As a follow-up disc to Bayflex, Saf-T-Cut (BY2) and (BZ2), or Blue Flash (BF2) disc-wheels.





BAYFLEX®

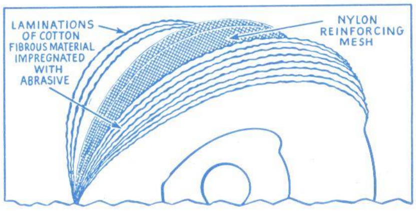
Bayflex reinforced resinoid disc-wheels (type FA2) have a fast smooth cutting action, with sufficient resiliency to hug the work well. On many instances, they are the perfect "do-it-in-one-operation" wheel . . . light roughing and finishing at the same time.

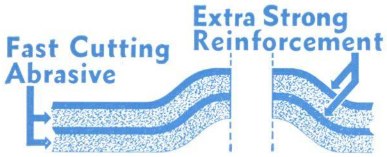
Bayflex reinforced **rubber** disc-wheels (type FP2) offer even more resiliency for finer blending and finishing.

TYPICAL APPLICATIONS

Medium Stock Removal—Light Snagging—Deburring—Blending and Finishing

1. Light weld removal on angle iron, pipe or other structural work.
2. Grinding and finishing stainless steel, copper, bronze, aluminum, or other alloy surfaces.


LAMINATIONS OF COTTON FIBROUS MATERIAL IMPREGNATED WITH ABRASIVE
NYLON REINFORCING MESH



BLUE FLASH®

Bay State "BF2" disc-wheels are used for heavy stock removal with faster cutting action than with any other types of reinforced wheel. They are constructed with abrasive grain covering the entire face of the wheel and can be used at a more horizontal level enabling the operator to use the face of the wheel as well as the edge. A special reinforcement is built into the center of the wheel as well as the back.

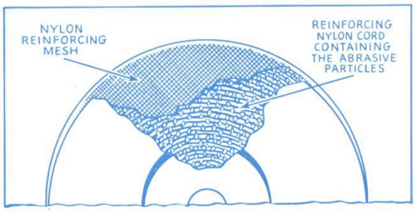
TYPICAL APPLICATIONS

1. Heavy weld grinding and finishing on all types of metal.
2. Smoothing down flame cut edges.
3. Beveling metal sections preparatory to welding.

GENERAL RECOMMENDATIONS

Use aluminum oxide "A" abrasive BF2 wheels for cutting: steel, stainless steel, cast iron, nodular iron, aluminum, manganese-bronze, and most other metals.

Use Silicon Carbide "C" abrasive BF2 wheels for mill scale removal on ship hulls or other steel plate.



SAF-T-CUT

Bay State's Saf-T-Cut disc-wheels (types BY2 and BZ2) are rugged wheels for rough, heavy-duty jobs. Both types of these disc-wheels can be used for essentially the same types of work. An important advantage of the BZ2 product, however, lies in its versatile range of hardness grades not offered by the BY2 wheel.

TYPICAL APPLICATIONS

Medium and Heavy Stock Removal—Snagging—Notching—Heavy-Duty Portable Grinding

1. Heavy weld removal on structural steel.
2. Notching all kinds or castings preparatory to knocking.
3. Removing heavy rust and mill scale, using "C" (Silicon Carbide) abrasive.
4. Smoothing down sharp, jagged flame-cut edges.

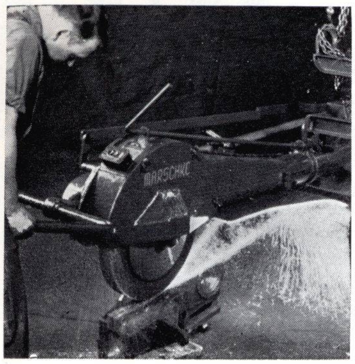
Snagging WHEELS

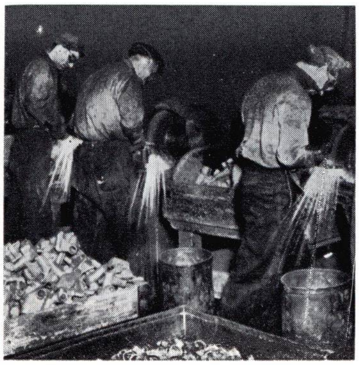
"Snagging" is a rough grinding operation used where a lot of material must be removed rapidly and at low cost. Swing-Frame, Floor-Stand, and Portable grinders are used.

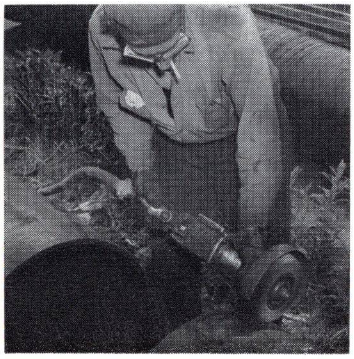
BAY STATE ®

WHEELS of PROGRESS

Snagging Wheels







Snagging is a highly important operation in many industries. The following paragraphs outline some of these operations in a few of the major industries.

Steel mills use swing frame grinders to remove seams, cracks, and other imperfections from stainless steel billets. Unless ground out before subsequent rolling or other forming operations, such imperfections become enlarged and spoil the product being made.

In welding and fabricating shops, much portable grinding is necessary to smooth down welds preliminary to painting, plating, or other final finishing operations. Flame-cut edges on boiler plate, or rough-cut ends of structural steel shapes such as pipe, angle-iron, and channels often require portable snagging before being incorporated in final assemblies.

Foundries make use of all types of snagging grinders to remove gates, risers, sprues, and imperfections from castings. The type of grinding equipment used depends upon the size of the casting, the area to be ground, and the amount of stock to be removed.

Standard snagging practice uses three main types of equipment, as illustrated on this page.

1. **SWING-FRAME GRINDERS.** Essentially, this is a jib crane carrying a suspended grinding-wheel-and-motor unit. Castings too heavy for manual lifting are brought to it by cranes.
2. **FLOOR OR BENCH-STAND GRINDERS.** These are rigid, stationary machines mounting one or more straight wheels. Castings light enough to be handled easily are held against the wheel on rests or tables.
3. **PORTABLE GRINDERS.** These are powered by electricity or air, and use straight wheels, reinforced disc-wheels, mounted wheels, and cups or cones.

STEEL MILL AND FOUNDRY SPECIFICATIONS

BAY STATE's "C" (Silicon Carbide) abrasive wheels are particularly suited for snagging materials of low tensile strength, such as gray iron, unannealed malleable iron, chilled iron, brass, soft bronze, magnesium, aluminum, and their alloys.

BAY STATE's "A" (Aluminum Oxide) abrasive wheels are used for grinding steel (and steel alloy) castings and forgings, annealed malleable iron, and tough bronze.

Material to Be Ground	*Vitrified* 6500 *sfpm* (*Max.*)	*Resinoid* 9500 *sfpm* (*Max.*)
Aluminum	C-20O4-V32 #4 Treated	3A-16O4-BA2 #4 Treated
Billets (High Carbon and High Speed Steels)		
Flexible Shaft		A-16Q4-BA2
Swing Frame		
Annealed Billets		A-143S4-BC2
Unannealed Billets		A-143S4-BC2
Billets (Stainless and Alloy Steels)		
Flexible Shaft		A-16Q4-BA2
Swing Frame		A-143U4-BC2
Swing Frame		A-143ZZ5-BS2ZE
Mechanical Grinders		VA-143ZZ5-BS2ZQ
Brass (Soft Bronze)	C-20P4-V32 #4 Treated	C-16O4-BA2 #4 Treated
Bronze (Hard)	3A-20P5-V22	3A-20O4-BA2
Cast Iron	C-16R4-V32	C-16Q4-BA2
Chilled Iron	C-16R4-V32	C-16P4-BA2
Forgings	A-16R5-V22	3A-16Q4-BA2
Magnesium	C-20O4-V32 #4 Treated	3A-16O4-BA2 #4 Treated
Malleable Iron (Annealed)	2A-146O5-V22	3A-143O4-BA2
Malleable Iron (Unannealed)	C-20R4-V32	C-16P4-BA2
Steel Castings (Low Carbon)		
Flexible Shaft	A-20Q5-V22	A-20Q4-BA2
Floor Stand	2A-16P5-V22	3A-16O4-BA2
Swing Frame		3A-143P4-BA2
Steel Castings (Manganese)		
Floor Stand	A-16P5-V22	3A-143P4-BA2
Swing Frame		3A-143Q4-BA2
Welds	3A-20Q5-V22	3A-16Q4-BA2
Wrought Iron	3A-16Q5-V22	3A-16Q4-BA2

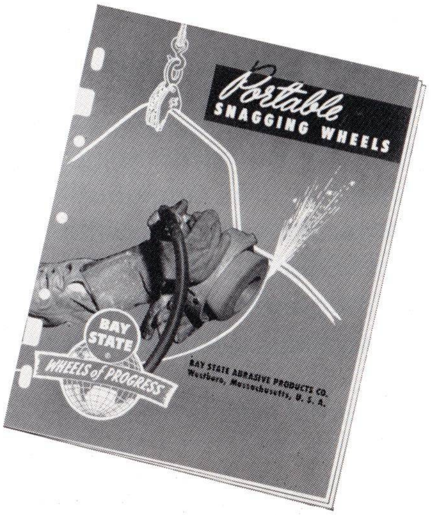
Vitrified Bonds are recommended for low speed operations (not in excess of 6500 sfpm).

Resinoid Bonds are designed for high speed operations (up to 9500 sfpm), where their resilient strength is needed for safety.

Extra Safety, in all resinoid bond wheels with arbor sizes of 6″ and larger, is insured by insertion of heavy gauge steel reinforcing rings.

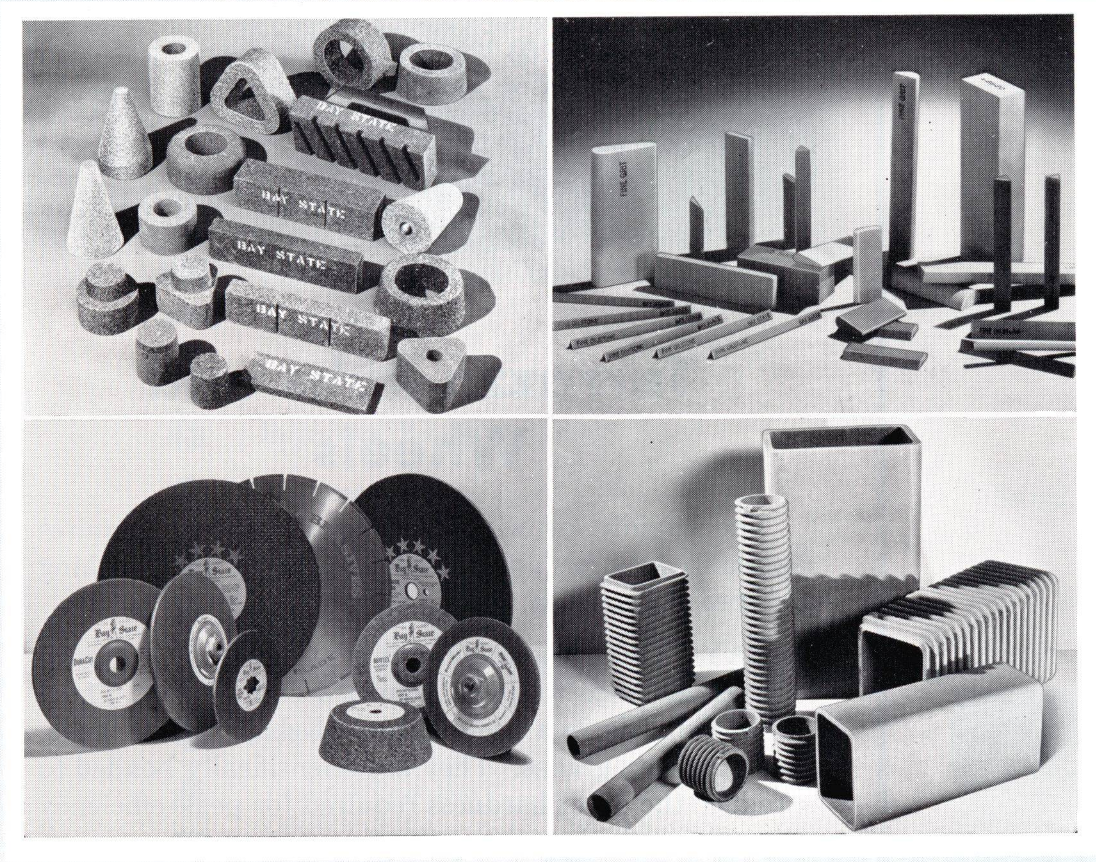
PORTABLE SNAGGING WHEEL SPECIFICATIONS

Use these recommendations as a general guide. For any specific problem-case, ask for BAY STATE's "On-the-Job" Engineering Service.


Portable
SNAGGING WHEELS
BAY STATE
WHEELS of PROGRESS
BAY STATE ABRASIVE PRODUCTS CO.
Westboro, Massachusetts, U. S. A.

Material	*Wheels*		*Maximum Speed sfpm*	*Specification*	
	Sizes (in.)	*Type*			
Aluminum and Aluminum Alloys	6″ and 8″	Type 1	9500	3A-24P4-BA2	#4 Treated
	6″	Type 11 Flaring Cup	9500	CA-16O4-BA2	#4 Treated
		Cones	9500	3A-24P4-BA2	#4 Treated
Billets (Alloy and High Speed Steels)	6″	Type 11 Flaring Cup	9500	3A-16Q4-BA2	
Billets (Stainless Steel)	6″	Type 11 Flaring Cup	9500	A-16Q4-BA2	
Brass	6″ and 8″	Type 1	9500	CA-16Q4-BA2	#4 Treated
		Types 16, 17, 18, 19 Cones		C-361M5-V32	#4 Treated
Bronze	6″ and 8″	Type 1	9500	3A-16Q4-BA2	#4 Treated
	6″	Type 11 Flaring Cup	9500	3A-20P4-BA2	#4 Treated
		Types 16, 17, 18, 19 Cones	6500	3A-24P5-V22	#4 Treated
Cast Iron	6″ and 8″	Type 1	9500	C-16Q4-BA2	
	6″	Type 11 Flaring Cup	9500	CA-16P4-BA2	
		Types 16, 17, 18, 19 Cones		C-24R4-V32 CA-24S4-BA2	
Couplers and Draw Bars	6″	Type 11 Flaring Cup	9500	3A-16Q4-BA2	
Forgings (Steel)	6″	Type 11 Flaring Cup	9500	3A-16Q4-BA	
Frogs and Switches	6″ and 8″	Type 1	6500	A-20P5-V22	
(Manganese Steel)	6″	Type 11 Flaring Cup	9500	A-16Q4-BA	
Granite	6″	Type 11 Flaring Cup	9500	C-16K4-BA2	
Inconel	6″	Type 11 Flaring Cup	9500	3A-20P4-BA2	
Manganese Steel (See Frogs and Switches)					
Ni-Hard	6″ and 8″	Type 1	9500	C-20O4-BA2	
Nodular Cast Iron	6″ and 8″	Type 1	9500	3A-20P4-BA2	
	6″	Type 11 Flaring Cup	9500	3A-16O4-BA2	
Pipe and Pipe Fittings (See Cast Iron)					
Stainless Steel Welds	6″ and 8″	Type 1	9500	3A-36P4-BA2 3A-24P4-BA2	
	6″	Type 11 Flaring Cup	9500	3A-16P4-BA2 3A-36Q4-BA2	
Steel Castings	6″ and 8″	Type 1	9500	3A-16Q4-BA2	
	6″	Type 11 Flaring Cup	9500	3A-24Q4-BA2	
		Types 16, 17, 18, 19 Cones		3A-20R4-BA2	

Special Products



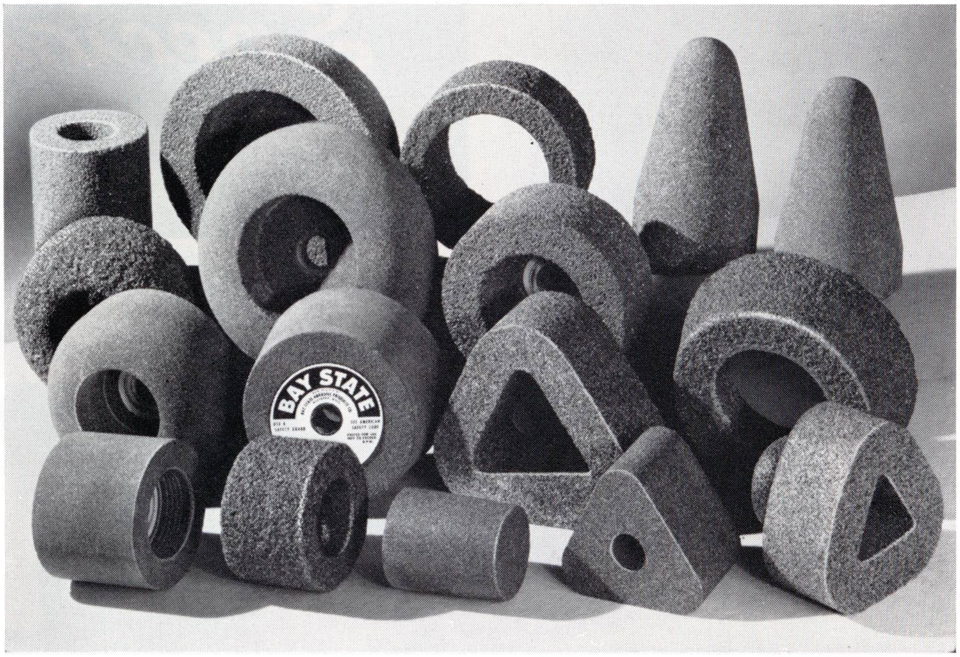
BAY STATE
®
WHEELS of PROGRESS

TERRAZZO RUBS AND WHEELS

OILSTONES

MINUTE-MAN PRODUCTS

REFRACTORIES



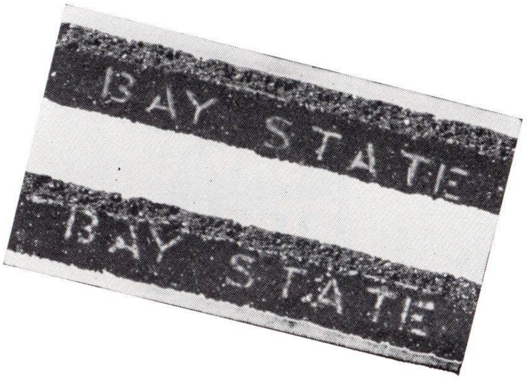
Terrazzo Rubs and Wheels

The rapidly growing Terrazzo Industry requires specialized wheels and rubs for roughing and finishing its special materials.

BAY STATE manufactures a complete line of such wheels and rubs to fit all standard equipment. These are obtainable in a wide variety of shapes, sizes, grits, and hardness grades. They are scientifically bonded to produce the exact hardness required for peak efficiency on each particular job.

SAFETY STAIR TREADS

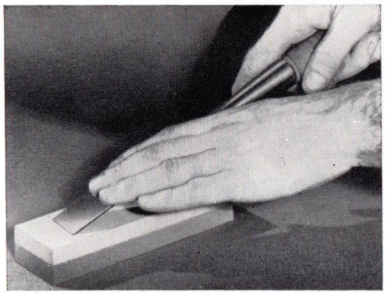
These non-slip inserts are used on either old or new stair treads. They are manufactured in standard dimensions of 1/4″ wide, 3/8″ thick, and 18″ long.



RUBS and WHEELS for the TERRAZZO, TILE and MARBLE INDUSTRIES

BAY STATE ABRASIVE PRODUCTS CO.
Westboro, Massachusetts, U. S. A.

Oilstones



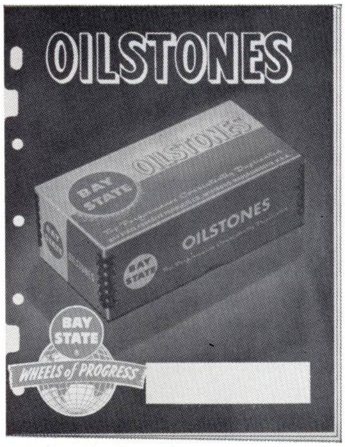
Bay State manufactures high quality oilstones in a wide variety of specialized shapes and sizes, as indicated below.

Rectangular
Combination
Square
Round
Half Round
Triangular
Tapered Slip Stones
Jointer Stones
Stones for Cemented Carbide Tools
Gouge Stone
Carvers' Slips
Engravers' Pencils
Axe Stone
Griddle Brick
Last Makers' Stone
Utility File
Tapered Rounds
Tapered Triangles
Silversmiths' Stones

SPECIALTY STONES

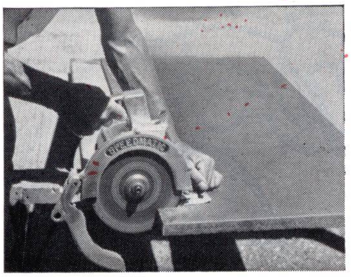
Diamond File
Aluminum Oxide Point
Knife Blade
General Purpose Stone
Reamer Stones
Skiving Knife Stone
Tapered Oval Plug
Auger Bit Stone

Send for catalog

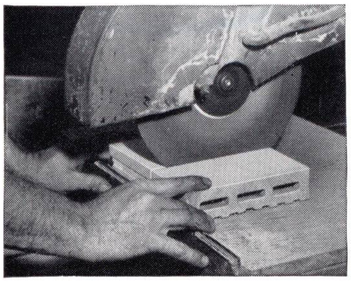


BAY STATE
WHEELS of PROGRESS

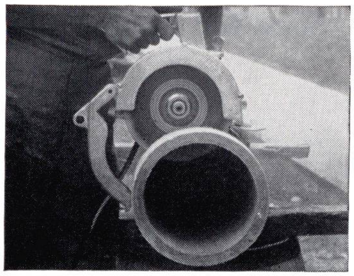
Bay State Minute-Man Products



CUTTING MARBLE SLAB



CUTTING GLAZED TILE



CUTTING TRANSITE PIPE

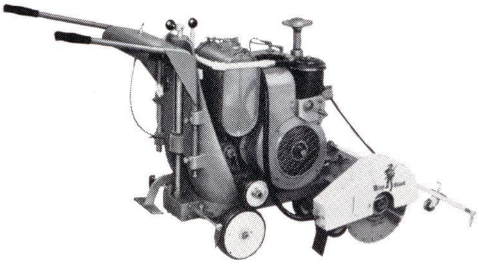
AVAILABLE ONLY THROUGH OUR SPECIALTIES DIVISION

For Cutting Refractory Masonry and Concrete Materials

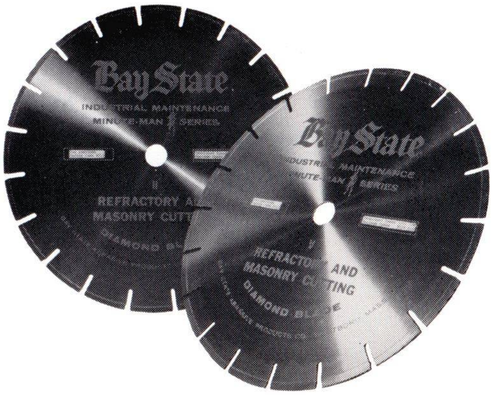
BAY STATE "Minute-Man" products represent a complete line of abrasive products, machines and accessories, for cutting masonry, refractory and concrete materials. Included in the line are:

Reinforced Resinoid Cut-Off Wheels
Diamond Blades
Rubbing Blocks
Core Drilling Machines
Diamond Core Drills
Concrete Saws
Raised Hub Disc-Wheels
Tuck Pointing Wheels
Refractory Cut-Off Saws
Etc.

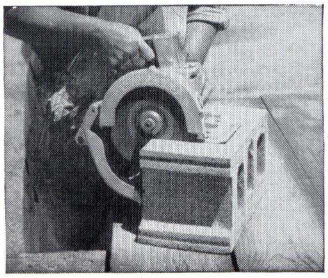
In short, here you will find the product and/or equipment to meet nearly every requirement for speedy, safe, low-cost cutting and maintenance repairs on masonry, refractory and concrete installations. Send for catalog.



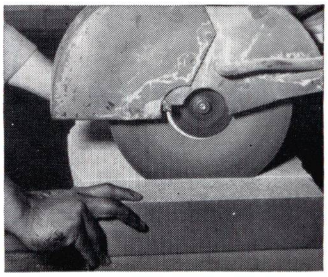
CONCRETE CUTTING MACHINE



DIAMOND BLADES

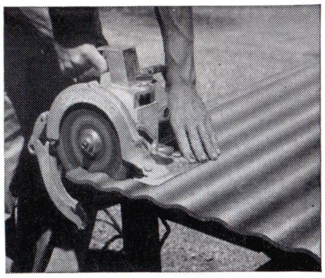


CUTTING CONCRETE BLOCK



CUTTING GRANITE BLOCK

CUTTING FIRE BRICK



CUTTING CORRUGATED PLASTIC

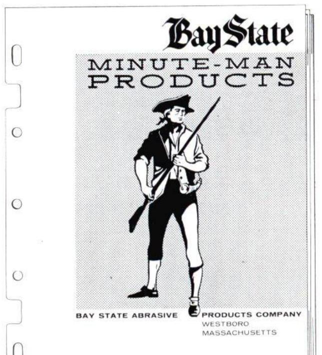
AVAILABLE ONLY
THROUGH OUR
SPECIALTIES DIVISION

For Industrial Plant Maintenance

BAY STATE "Minute-Man" products, abrasive wheels and machines are designed and manufactured in accordance with our rigidly established quality standards. They are ideally suited for in-plant maintenance jobs . . . quickly saw and finish concrete floors, curbs, ramps, etc. Make fast neat trenches for pipelines, conduits, drains, etc. Leave edges straight and smooth instead of rough and broken.

Whenever you are cutting refractory or masonry materials, on your construction site or doing in-plant maintenance jobs on concrete, you will find our Minute-Man Products Catalog a very helpful aid in selecting the proper diamond blade, abrasive product, or machine.

Send for complete catalog



BayState
MINUTE-MAN
PRODUCTS
BAY STATE ABRASIVE PRODUCTS COMPANY
WESTBORO
MASSACHUSETTS

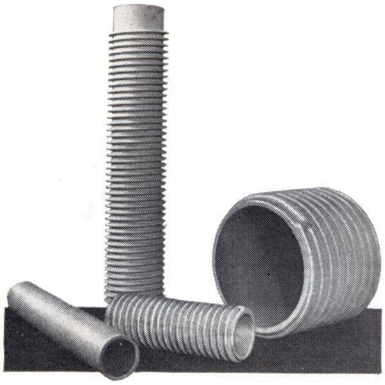
Refractories

BAY STATE manufactures many types of highest quality electric furnace refractories combining all the essential characteristics for good refractory linings or muffles:

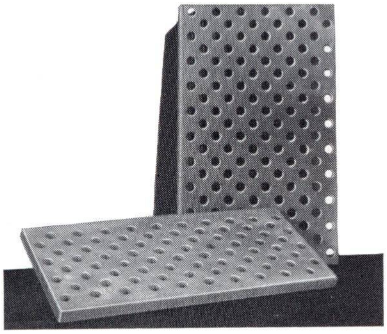
1. High resistance to thermal shock.
2. High thermal conductivity.
3. Deformation points well above furnace operating temperatures.
4. Good dielectric strength.

Many industries also benefit from Bay State's carefully made abrasive filters for gases and liquids. Exceptionally resistant to acids and alkalies, these filters are produced in a wide variety of forms, in the proper structures for the fluid resistance required.

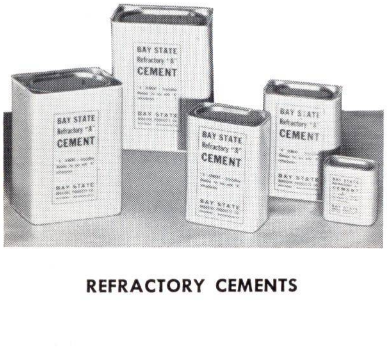
Write to Bay State for detailed information or assistance in the selection of abrasive filters.



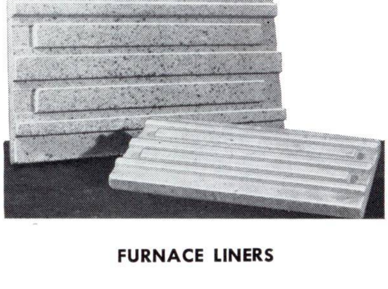
CYLINDRICAL FURNACE CORES
(Threaded or Plain)



RADIANT HEAT
FURNACE LINERS



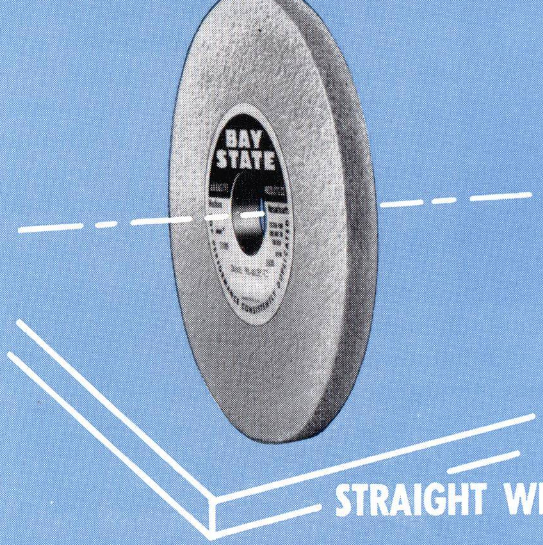
REFRACTORY CEMENTS



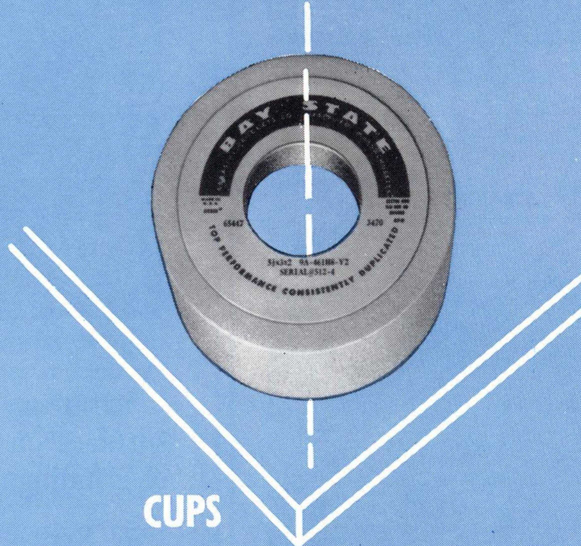
FURNACE LINERS

MISCELLANEOUS FURNACE PARTS

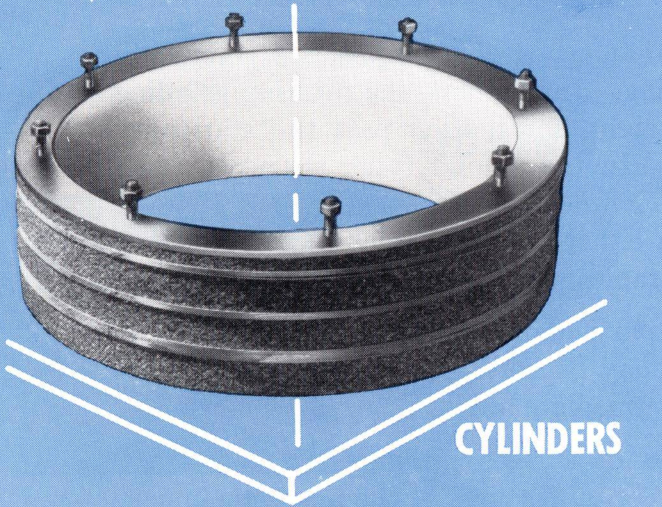
Surface GRINDING WHEELS



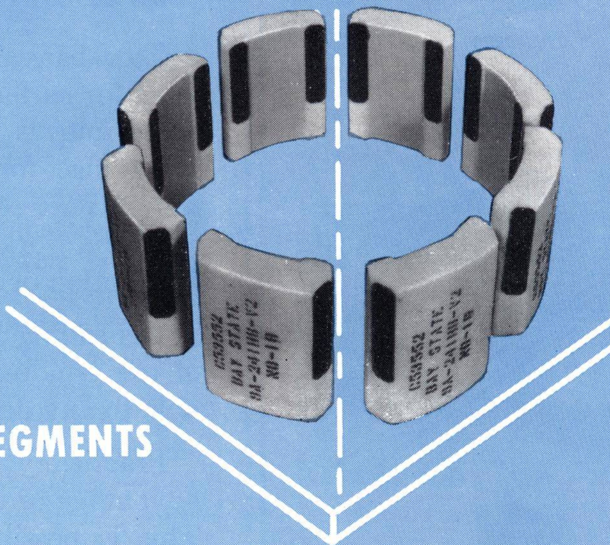
STRAIGHT WHEELS



CUPS



CYLINDERS



SEGMENTS

This type of grinding operation is done on plane or flat surfaces, and is accomplished on either a horizontal or vertical spindle type of grinding equipment.

Surface Grinding

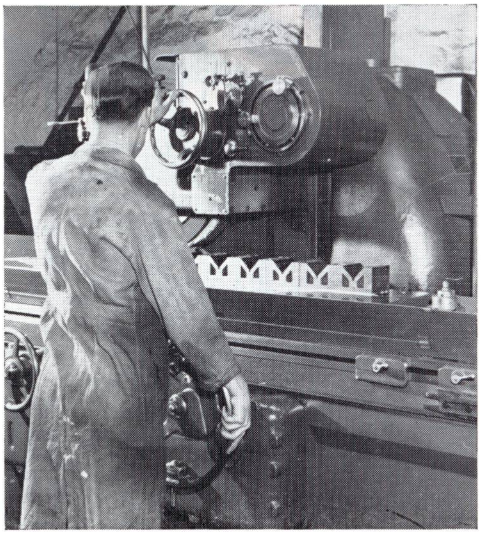
COMMONLY USED SHAPES

STRAIGHT

CYLINDERS

CUPS

SEGMENTS



Surfacing grinding produces straight plane or contoured surfaces on metallic or non-metallic materials. Four types of grinding wheels are in common use for this purpose:

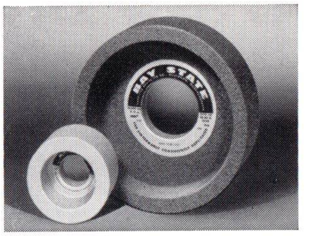
1. **Straight wheels**
2. **Cylinders**
3. **Cup wheels**
4. **Segmental Type**

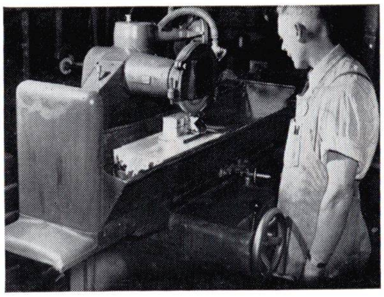
Two basically different types of machines are commonly used for surface grinding. In the first, the rotating grinding wheel moves with straight line motion past the stationary work piece or pieces. In the second type, the work itself moves past the rotating wheel. This may be accomplished with the work held on either straight tables with reciprocating motion or circular tables with rotary motion.

Depending on the particular machine used, the spindle of the grinding wheel may be horizontal, vertical, or adjustable to any desired intermediate angle.

Practically all types of surface grinding machines take advantage of the easy set-up features of the magnetic chuck. This is possible because of the relatively small tangential forces between the grinding wheel and the work. Small parts are "ganged" on the magnetic chuck, each one passing by the wheel in succession. Even non-magnetic parts may be held this way by bracketing them between pieces of steel.

BAY STATE
WHEELS of PROGRESS

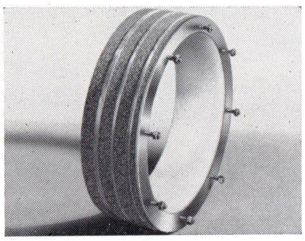


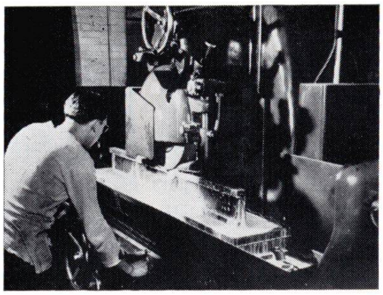


In selecting straight wheels, as well as segments, cup or cylinder wheels for surfacing, it should be remembered that the wheel must be soft enough to wear away in use so as to keep itself sharp. A very common mistake is using too hard a wheel, with the result that the abrasive grains remain in the wheel face long after they become dulled. This leads to glazing of the wheel, reduced output of work and trouble with burning and cracking the work surface.

It has been found that dry surface grinding requires softer wheels than wheels used for wet grinding . . . fine finishes require finer wheels. Frequently a slight change in the ratio of work-speed to wheel-speed makes it possible to use wheels that otherwise would be too hard or too soft for the operation.

CYLINDERS



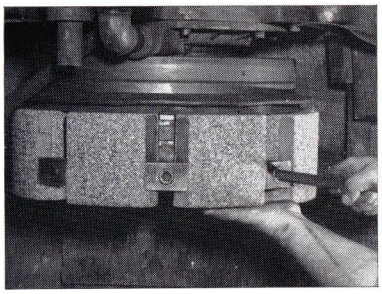


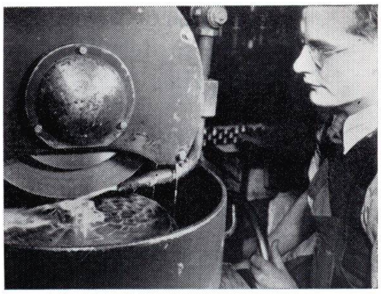
A commonly used type of vitrified cylinder wheel for surfacing operations is wire wound, mounted on a steel back (Gammeter mounting) with steel studs threaded into the steel plate.

This arrangement permits the wheel to be mounted on a special adaptor attached to the machine, thereby permitting the wheel to be used down to the steel mounting plate. Without this method of attachment, it is necessary to hold the wheel by means of a chuck which overlaps the wheel an inch or so, thereby wasting this much of the wheel.

Equally as common for this type of surfacing are the resinoid bonded inserted nut cylinder wheels.

SEGMENTS





Segments are manufactured in several different shapes to fit the various manufacturers' chuck assemblies. The following are the commonly used chucks: Blanchard, Bridgeport, Capitol, Carborundum, Cortland, Crossley, Diamond, Hanchett, Hill, Norton, Peninsular, Rogers, Safety, Seybold, Sterling.

Segments have definite advantages for particular types of work. One of the most important is the fast, free, cool-cutting action that results from the broken contact and the easy escape of residue and worn abrasive grains. Other advantages briefly are as follows:

1. Savings in cost over solid cylinder type wheels.
2. Deep cuts and rapid work speeds are possible.
3. Amount of usable abrasive greater than with solid wheels.
4. Harder grades can be used, resulting in less wheel wear.
5. Mounting is easier than solid wheels.
6. Segments break less easily in shipping and handling.

BAY STATE WHEELS of PROGRESS

Surface Grinding

RECOMMENDED SPECIFICATIONS

STRAIGHT WHEELS

Material	*Specification*
Bronze (Wheel Types 1, 5, 7)	8A-461J8-V22
Cast Iron (Wheel Types 1, 5, 7)	C-361H8-V32
Cemented Carbides	D-120L4-B
Roughing (Wet)	3C-60H12-V32
(Dry)	3C-60G12-V32
Finishing (Wet)	3C-120G12-V32
(Dry)	3C-120F12-V32 D-220L4-B
Chilled Iron (Wheel Types 1, 5, 7)	C-361H8-V32
Dies, Drawing (Wheel Types 1, 5, 7)	
(Hard)	9A-461H8-V22
(Soft)	9A-461I8-V22
Gears (Hardened Steel) (Wheel Types 1, 5, 7)	8A-46I8-V22
Piston Rings (Cast Iron or Semi-Steel)	
(Rough)	A-70L8-V22
(Finish)	C-320K9-BC2
Steel (Hardened) (Wheel Types 1, 5, 7)	9A-461H8-V22
Steel (High Speed) (Wheel Types 1, 5, 7)	9A-461I12-V22
Steel (Soft) (Wheel Types 1, 5, 7)	9A-361J8-V22
Steel (Stainless—Free Machine) (Wheel Types 1, 5, 7)	9A-461H8-V22
Steel (Hardened Stainless) (Wheel Types 1, 5, 7)	9A-461H8-V22

CUPS AND CYLINDERS

Material	Specification
Aluminum and Aluminum Alloys	C-241I8-V32 #4 Treated
Ball Races—Radial (Soft Steel)	9A-461I12-V22
Ball Races—Radial (Hardened Steel)	9A-80F12-V23
Ball Races—Thrust (Hardened)	9A-80F12-V23
Brass	C-241H8-V32
Brick (Vitrified)	C-201K8-V32

CUPS AND CYLINDERS (continued)

Material	*Specification*
Carbon	C-161J8-V32
Cast Iron	C-241H8-V32
Chilled Iron	C-241H8-V32
Clay Blocks	C-14N8-V32
Colmonoy	C-361G8-V32
Connecting Rods	8A-241J8-V22
Copper	C-161I8-V32
Dies, Drawing (Hardened)	9A-301H8-V22
Gears (Hardened Steel)	8A-301H8-V22
Sad Irons	9A-16I8-V22
Shear Blades	9A-461G8-V22
Steel (Hardened)	9A-301H8-V22
Steel (High Speed)	9A-361G8-V22
Steel (Soft)	9A-241G8-V22
Steel (Stainless—Free Machine)	9A-361G8-V22
Steel (Hardened Stainless)	9A-361G8-V22
Vitreous Ware	C-241K8-V32

SEGMENTS

Material	Specification
Aluminum and Aluminum Alloys	C-241I8-V32
Brass	C-241H8-V32
Brick (Vitrified)	C-201K8-V32
Cast Iron	C-241H8-V32
Chilled Iron	C-241H8-V32
Clay Blocks	C-16L8-V32
Colmonoy	C-361G8-V32
Dies, Drawing (Hardened)	9A-301H8-V22
Gears (Hardened Steel)	8A-301H8-V22
Guide Bars	3A-16M8-V22
Housings (Auto Axle)	3A-16M8-V22
Sad Irons	9A-241H8-V22
Shear Blades	3A-461G8-V22
Steel (Hardened)	9A-301H8-V22
Steel (High Speed)	9A-461G8-V22
Steel (Soft)	9A-241G8-V22
Steel (Stainless—Free Machine)	8A-361G8-V22
Steel (Hardened Stainless)	8A-361G8-V22
Vitreous Ware	C-241K8-V32

BAY STATE ® WHEELS of PROGRESS

Thread GRINDING WHEELS

BAY STATE
®
WHEELS of PROGRESS

Thread grinding has requirements peculiarly its own, and requires highly specialized wheels. Bay State is well equipped to meet your specific needs in this demanding field.

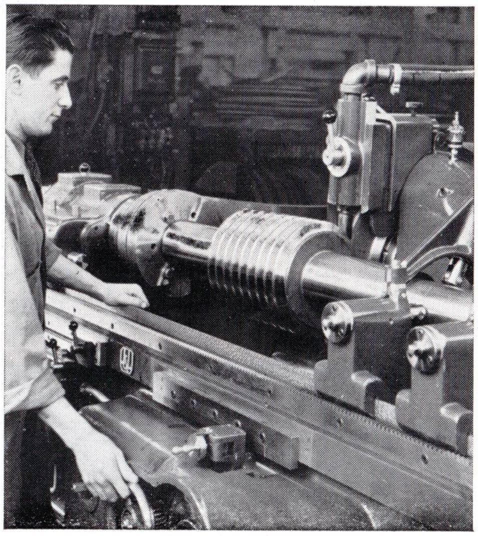
Thread Grinding Wheels

With specially shaped cutting faces, the grinding wheel produces either internal or external threads. Practically all the sizes, pitches, and shapes of screw threads are readily ground from the solid, in a variety of materials.

The wheels must be trued and balanced with exceptional care, since their operating speeds are unusually high. They are almost always used with oil as a combined coolant and lubricant. Cutting faces are crush-formed or diamond-dressed for one of the following uses:

1. **Single Form** (shown in illustration). Here, the thread is developed in one or more traverses of the wheel along the rotating work. When several passes are required, cutting contact may be maintained in both directions, if desired.
2. **Multi Form.** The faces of such wheels are sometimes as wide as the total length of the thread to be cut, and the complete thread is produced in one revolution of the workpiece.

   A three-rib type is often used, in which the first rib takes a roughing cut, the second an intermediate, and the third a finishing cut. This type of wheel is of course traversed.



COMMONLY USED SIZES

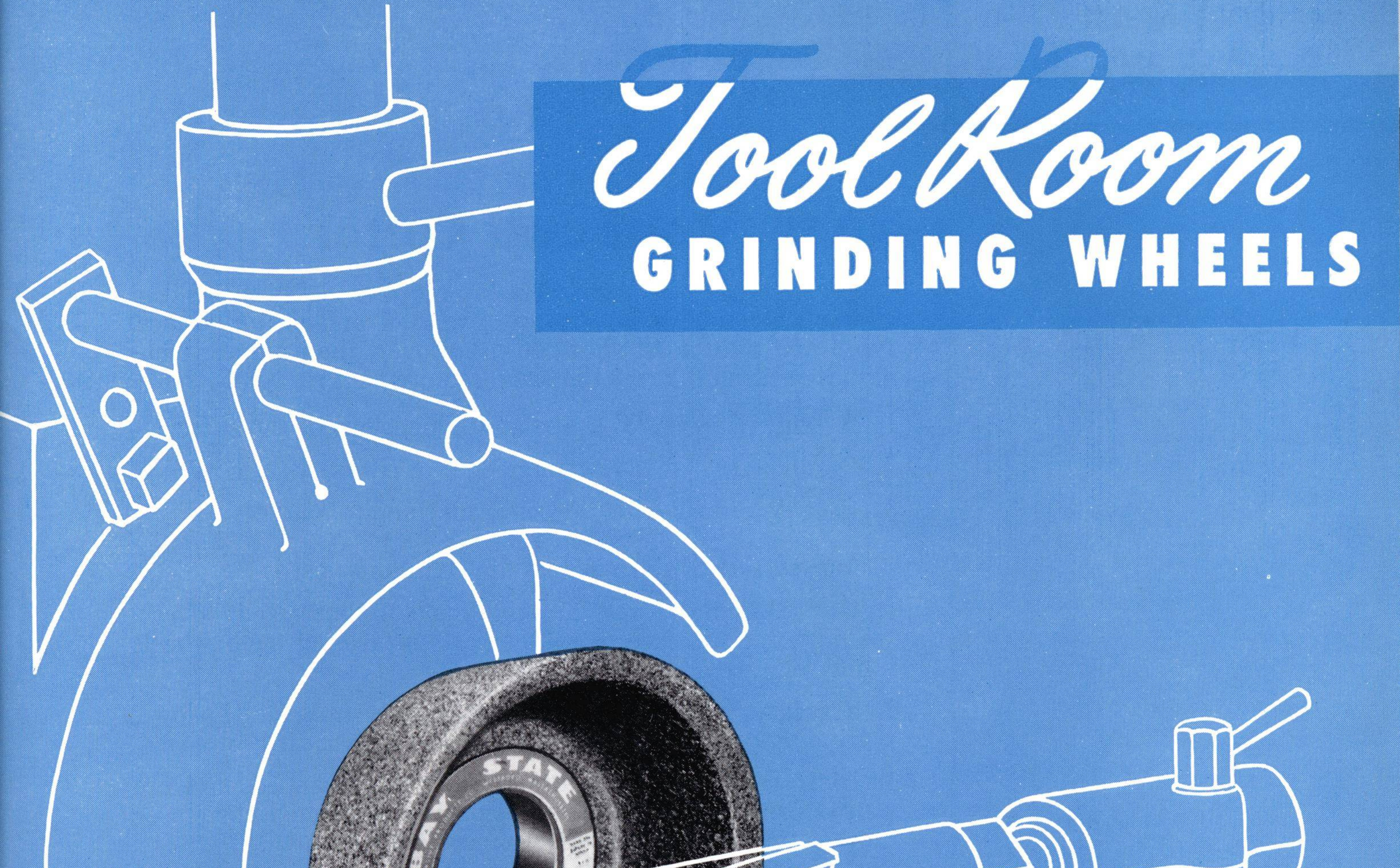
O.D.	4–24″
Thickness	$\frac{1}{4}$–$\frac{3}{4}$″
Speed	6500–12,000 sfpm
Work Speed	$1\frac{1}{2}$–25 sfpm

SPECIFICATIONS

THREAD GRINDING—H. S. Tool Steel—Thread Form 60°

	External	*Internal*
8 Pitch and Under	A-80S9-BA2 9A-80J8-V22	A-60V9-BA2 9A-80K8-V22
8–12 Pitch	A-100T9-BA2 9A-100K8-V22	A-80V9-BA2 9A-120L8-V22
12–16 Pitch	A-1202T9-BA2 9A-150L8-V22	A-100V9-BA2 9A-150M8-V22
16–36 Pitch	A-150T9-BA2 9A-220M8-V22	A-120V9-BA2 9A-220N8-V22
36–60 Pitch	A-180T9-BA2 9A-280N8-V22	A-150V9-BA2 9A-280N8-V22
60 and Finer	A-220T9-BA2 9A-320N8-V22	

Tool Room GRINDING WHEELS



BAY STATE ®
WHEELS of PROGRESS

This is a type of grinding to bring dull cutting tools back to a state of sharpness. Dull tools are expensive, and to maintain maximum efficiency, frequent and correct regrinding is necessary.

Tool and Cutter

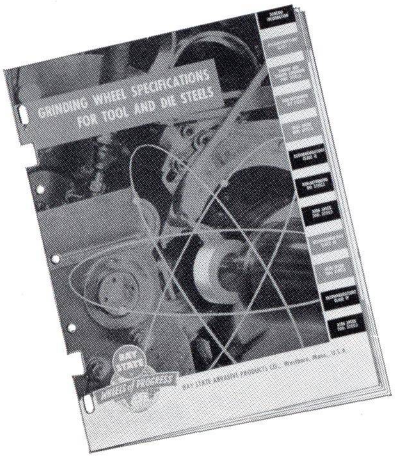
The machine tool world of today requires highly specialized grinding techniques for a myriad of tool and cutter shapes, types and materials. Basically, however, the separate techniques used must meet the same requirements:

1. Retain the essential shape and dimensions of the cutter.
2. Produce new, sharp cutting edge (or edges).
3. Provide proper relief and clearance angles.

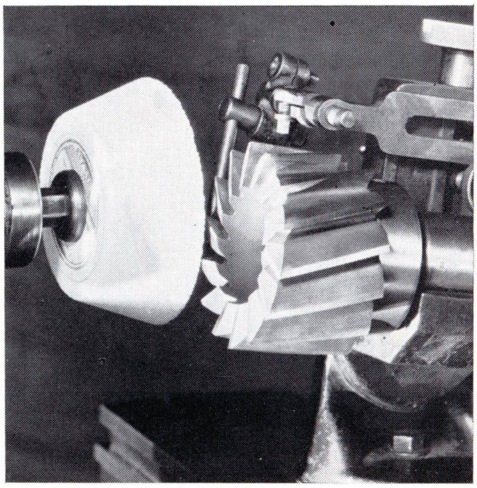
Four standard wheel-shapes are commonly used:

1. **Cup Wheels** (Type 11 and Type 6 illustrated below). Either the flat face or the conical surfaces of such wheels may be used.
2. **Straight Wheels.** Here the face may be used for "hollow" grinding or "flat" grinding (with the axis slightly tilted).
3. **Dish Wheels.** These are actually dish shaped, and are used principally in the re-sharpening of formed cutters or other tools where spaces between teeth are small.
4. **Gammeter-Mounted Wheels.** These are cylindrical wheels mounted in rubber on a steel plate. They are much used for grinding single-point tools, either offhand or with the tool held in suitable fixtures to assure correct angles.

This is a fact-filled, 24-page booklet, listing proven wheel specifications for grinding all of the various grades of tool and die steels.



GRINDING WHEEL SPECIFICATIONS FOR TOOL AND DIE STEELS



Wheel sizes, shapes and speeds vary widely for use in sharpening drills, taps, broaches, hobs, chasers, chip-breakers, and a multitude of milling cutters.

RECOMMENDED SPECIFICATIONS

Type of Work	*Specification*	
	High Speed Steel	*Cemented Carbides*
ARBOR		
Cylindrical Grinding		
Roughing	8A or 9A-461K5-V22	3C-60H8-V32 D-100L4-B
Finishing	8A or 9A-60J6-V22	D-220L4-B
BORING TOOLS		
Tool and Cutter Grinder	8A or 9A-461J5-V22	
BROACHES—FLAT		
Sharpening		
Reciprocating Table—Dry	8A or 9A-60H8-V22	3C-120F9-V32 D-240N4-BA
Wet	8A or 9A-60I8-V22	3C-120F9-V32 D-240R4-BA
Backing Off (Cup Wheels)	8A or 9A-60J6-V22	3C-120F9-V32 D-180N4-BA
Sharpening (Dish Wheels)	8A or 9A-80K7-V22	D-180N4-BA
Notching	A-70P6-BJ2	
BROACHES (Form)		
Sharpening		
Cylindrical—Wet	3A-80K7-V22	3C-120F9-V32 D-180N4-BA
Dish Wheels—Dry	8A or 9A-80J7-V22	3C-60H8-V32 D-180N4-BA
CHASERS		
Circular Thread Chasers		
Sharpening		
Tool and Cutter Grinder (Dish Wheel)	8A or 9A-461J5-V22	D-150N4-BA
Tangent Thread Chasers		
Sharpening (Straight Wheel)	8A or 9A-461I8-V22	
Tool and Cutter Grinder (Cup Wheel)	8A or 9A-461J5-V22	
Geometric Chaser Grinder		
9 x ¾ x 1¼ (Type 12)	8A or 9A-60J6-V22	
9 x ⅜ x 7	3A-60M6-BA2	
9 x ⅛ x 7	A-60P6-BA2	

Type of Work	*Specification*	
	High Speed Steel	*Cemented Carbides*
Tap and Die		
Grind Rake (Straight Wheel)	8A or 9A-461H5-V22	
Tool and Cutter Grinder (Cup)	8A or 9A-461J5-V22	
Grind Chamfer		
Tool and Cutter Grinder	8A or 9A-60J6-V22	
CHISELS		
Sharpening	3A-60K6-V22	
COUNTERBORES AND SPOT FACERS		
Sharpening		
Large		
Tool and Cutter Grinder (Type 11)	8A or 9A-60I8-V22	D-150N4-BA 3C-60G8-V32
Small		
Tool and Cutter Grinder (Type 11)	8A or 9A-60J8-V22	D-150N4-BA 3C-60G8-V32
Shaping Tooth		
Tool and Cutter Grinder (Type 12)	8A or 9A-60I8-V22	D-150N4-BA 3C-60G8-V32
DIES		
Blanking Die		
Surfacing		
Reciprocating Table	8A or 9A-461H8-V22 8A or 9A-461G8-V22	
Vertical Spindle (Cyl.)	8A or 9A-301H8-V22 8A or 9A-361H12-V22	
Internal	8A or 9A-60J6-V22	
Cold Heading Dies		
Surfacing		
Reciprocating Table	8A or 9A-461H8-V22 8A or 9A-461G8-V22	
Vertical Spindle (Cylinders)	8A or 9A-301H8-V22	
(Segments)	8A or 9A-361H12-V22	
Cold Trimming Dies		
Surfacing		
Reciprocating Table	8A or 9A-461H8-V22 8A or 9A-461G8-V22	

RECOMMENDED SPECIFICATIONS (Continued)

Type of Work	*Specification High Speed Steel*
Vertical Spindle (Cylinders)	8A or 9A-301H8-V22
(Segments)	8A or 9A-361H12-V22
Drawing Dies	
Surfacing	
Reciprocating Table	8A or 9A-461H8-V22 8A or 9A-461G8-V22
Vertical Spindle (Cylinders)	8A or 9A-301H8-V22
(Segments)	8A or 9A-361H12-V22
Internal	8A or 9A-60J6-V22
Deep Drawing Dies	
Surfacing	
Reciprocating Table	8A or 9A-461H8-V22 8A or 9A-461G8-V22
Vertical Spindle (Cylinders)	8A or 9A-301H8-V22
(Segments)	8A or 9A-361H12-V22
Internal	8A or 9A-60J6-V22
Die Blocks—Hot Forging	
Surfacing	
Reciprocating Table	8A or 9A-461H8-V22 8A or 9A-461G8-V22
Vertical Spindle (Cylinders)	8A or 9A-241H8-V22
(Segments)	8A or 9A-301H12-V22
Hot Trimming Dies	
Surfacing	
Reciprocating Table	8A or 9A-461H8-V22 8A or 9A-461G8-V22
Vertical Spindle (Cylinders)	8A or 9A-301H8-V22
(Segments)	8A or 9A-361H12-V22
Die Grinding—General	
Portable—(Offhand)	
9500 sfpm Maximum	3A-36Q4-BA2
6500 sfpm Maximum	3A-46Q5-V22
Mounted Wheels	
Coarse	8A or 9A-60O5-V72K
Medium	8A or 9A-90O6-V72
Fine	8A or 9A-120O7-V72K
Internal Grinding—Standard Internal Machines	
Mounted Wheels	8A or 9A-80K6-V22
Wheels 7/16″ Diameter and Smaller	8A or 9A-80K6-V22

Type of Work	*Specification High Speed Steel*	*Specification Cemented Carbides*
Wheels ½″ to 1¼″ Diameter	8A or 9A-60K5-V22	
Wheels Larger than 1¼″	8A or 9A-60J6-V22	
Portable Grinders and Attachment		
Mounted Wheels	8A or 9A-90O6-V72	
Wheels 7/16″ Diameter and Smaller	8A or 9A-60K5-V22	
Wheels ½″ to 1¼″ Diameter	8A or 9A-46K4-V22	
Wheels Larger than 1¼″	8A or 9A-46J5-V22	
Surface Grinding—Reciprocating Table Type		
Wheels 10″ Diameter and Under		
1″ Thick		
Heavy	8A or 9A-461I8-V22	
Light	8A or 9A-461H12-V22	
Form Grinding	8A or 9A-80J8-V22	
Wheels 10″ to 14″ Diameter		
1″ and Thicker		
Heavy	8A or 9A-461I12-V22	
Light	8A or 9A-461G12-V22	
Rotary Table Type Machine		
Thick Stock	8A or 9A-461J8-V22	
Thin Stock	8A or 9A-461I8-V22	
Reciprocating and Rotating Type Machines		
10″ to 18″ Diameter Wheels		
Large Areas	8A or 9A-241G8-V22	
Medium Areas	8A or 9A-241H8-V22	
Small Areas	8A or 9A-301H8-V22	

DRILLS—TWIST

Type of Work	*Specification High Speed Steel*	*Specification Cemented Carbides*
Resharpening		
Offhand		
1″ Diameter and Larger (Type 1)	3A-46K5-V22	
½″–1″ (Type 1)	3A-60K6-V22	
½″ and Smaller (Type 1)	3A-80J7-V22	
Machine		
½″ and Larger (Type 6)	3A-46K5-V22	D-100M4-B 3C-120F9-V33

RECOMMENDED SPECIFICATIONS (Continued)

Type of Work	*Specification* *High Speed Steel*	*Cemented Carbides*
¼″–½″ (Type 6)	3A-60K6-V22	
¼″ and Smaller (Type 6)	3A-100I8-V22	
Flutes		
Grinding (Type 1)	A-100V14-R22	
Polishing (Type 1)	2A-603Q6-RQ2	
Point Thinning (Type 1)	A-60N6-V22	
Cut Off (Type 1)	A-60N6-J2	
FORM TOOLS		
Form Grinding		
Surfacing (Type 1)	9A-60I8-V22	D-220N4-BA
Small Radii (Type 1)	9A-150K8-V72K	3C-120F9-V33
GAUGES (Block)		
Surfacing		
Roughing (Type 1)	8A or 9A-461H8-V22	D-100R4-B 3C-60H12-V32
Finishing (Type 1)	8A or 9A-80G8-V22	D-220N4-BA 3C-120F9-V33
GAUGES (Plug)		
Cylindrical		
Roughing (Type 1)	8A or 9A-60J6-V22	D-100R4-B 3C-60H8-V32
Finishing (Type 1)	8A or 9A-120J8-V22	D-220N4-BA 3C-120F9-V33
GAUGES (Ring)		
Internal Grinding		
Roughing (Type 1)	8A or 9A-60J6-V22	D-100N4-BA 3C-60H8-V32
Finishing (Type 1)	8A or 9A-100I8-V22	D-220N4-BA 3C-120F9-V33
HOBS		
Large 4″ Diameter and Over		
Indexing from Master	8A-603H6-V22	D-120N4-BA
Tool and Cutter Grinder (Type 12)		3C-60G8-V32
Barber-Colman Grinder	8A-603H6-V22	D-120N4-BA 3C-60G8-V32

Type of Work	*Specification* *High Speed Steel*	*Cemented Carbides*
Small 4″ Diameter and Under		
Indexing from Master	8A or 9A-60J8-V22	D-120N4-BA
Tool and Cutter Grinder (Type 12)		3C-60G8-V32
Barber-Colman Grinder	8A-603H6-V23	
LATHE CENTERS		
Cylindrical Grinders	3A-60K6-V22	D-180R4-B
LATHE AND PLANER TOOLS		
Sharpening		
Offhand—Roughing Dry	A-36O5-V22	3C-60G8-V32 D-100R4-B
Finishing Dry	A-60M6-V22	3C-120F9-V33 D-180R4-B
Roughing Wheels Wet		D-100P4-MA
12″–24″ Diameter	A-36O5-V22	3C-60G8-V32
Over 24″ Diameter	A-24O5-V22	
Machine Sharpening		
Sellers Type Wheels		
15″ Diameter	8A-46J5-V22	3C-60G8-V32
24″ Diameter	8A-36K5-V22	
Gisholt Type	3A-24K5-V22	
Sharpening in Fixture		
Surface Grinder	8A or 9A-46IH8-V22	D-120N4-BA 3C-60G8-V32
Tool and Cutter Grinder		
Large Tools (Type 11)	8A or 9A-461J5-V22	D-150N4-B 3C-60G8-V32
Small Tools (Type 11)	8A or 9A-60J6-V22	D-220N4-BA 3C-120F9-V33
MILLING CUTTERS		
Small Mills		
Straight Wheels	8A or 9A-60J6-V22	D-220N4-BA D-180N4-B
Cup and Dish Wheels	8A or 9A-60J6-V22	3C-60G8-V32

BAY STATE
WHEELS of PROGRESS

Tool Room Grinding Wheels

RECOMMENDED SPECIFICATIONS (Continued)

Type of Work	*Specification* *High Speed Steel*	*Cemented Carbides*
Large Mills		
Straight Wheels	8A or 9A-461J5-V22	D-180N4-BA
Cup and Dish Wheels	8A or 9A-461J8-V22	D-150N4-B 3C-60G8-V32
Ingersoll Grinder	8A-54J5-V22	3C-60I8-V32
Formed Cutters (Type 12)	8A or 9A-461J5-V22	D-180N4-B 3C-60G8-V32
Spiral Milling	8A or 9A-461J5-V22	D-180N4-B 3C-60G8-V32
Rotary Gear	8A or 9A-461J5-V22	D-180N4-B 3C-60G8-V32
Gear Shaper	8A or 9A-60J6-V22	D-180N4-B 3C-60G8-V32
REAMERS		
Cylindrical Grinding	8A or 9A-60K6-V22	
Backing Off	8A or 9A-461K5-V22	
Sharpening		
Barber-Colman Grinder	A-80J8-BA2	
Grinding Circular Relief	3A-80I7-V22	
SAWS (Band)		
Gumming	3A-46M5-V22 3A-361N6-BA2HL	
SAWS (Circular)		
Gumming	3A-461M5-V22	

Type of Work	*Specification* *High Speed Steel*
SAWS (Metal Cutting)	
Gumming	3A-60P6-V22 3A-80P8-BA2
TAPS	
Grinding Relief	8A or 9A-80J7-V22
Squaring End	3A-60N6-V22
Fluting (Small Taps)	A-100V14-R22
(Large Taps)	8A or 9A-46L5-V22
Polishing	A-603Q6-RQ2
Cutting-Off	A-60N6-BJ2
Threading	
Pitch	
(8 and under)	8A or 9A-80J8-V22 A-80S9-BA2
(8–12)	8A or 9A-1002K8-V22 A-120T9-BA2
(12–16)	8A or 9A-150K8-V22 A-120S9-BA2
(16–36)	8A or 9A-220K8-V22 A-150T9-BA2
(36–60)	8A or 9A-280K8-V22 A-180T9-BA2
(60 and Finer)	8A or 9A-320K8-V22 A-220T9-BA2
Shanks (Cylindrical)	3A-80L7-V22

Recommended SPECIFICATIONS

For your convenience, these general specifications are listed alphabetically by materials or products. For special cases, request BAY STATE'S "On-the-Job" Engineering Service.

Recommended Specifications

Class of Work	*Specification*
AGATE	
Offhand Roughing	1C-80M8-V32
Offhand Finishing	1C-220L9-V32
Cutting-Off (Wet)	D-80N2-M
ALNICO	
Offhand	3A-36N5-V22
Cylindrical	3A-54L5-V22
Surfacing	9A-60H8-V22
Cutting-Off (Wet)	A-80K0-R22
ALUMINUM AND ALUMINUM ALLOYS	
Centerless	C-54K6-V32
Cylindrical	C-461K5-V32
Internal	C-361K5-V32
Cutting-Off	
Bars	A-24U6-R22
Tubing or Small Sections	A-120T0-R22
Snagging	
Portable	
9500 sfpm Maximum	3A-24P4-BA2 #4 Treated
Floor Stands	
6500 sfpm Maximum	C-20P4-V32 #4 Treated
9500 sfpm Maximum	3A-16O4-BA2 #4 Treated
Surfacing	
Cups and Cylinders	C-241I8-V32 #4 Treated
Discs	C-24L4-BA2 #4 Treated
Segments	C-241I8-V32
ARMATURES (Laminations)	
Cylindrical	3A-36M5-V22
ASBESTOS—Cutting-Off	C-24N8-BJ2
AXES (Forgings)	
Siding	3A-36T5-V22
Edging	
6500 sfpm Maximum	3A-24R5-V22
9500 sfpm Maximum	A-30Q4-BA2
AXLES (Auto)	
Cylindrical	3A-46M5-V22
Centerless	A-46N5-V22

Class of Work	*Specification*
AXLES (Railway)	
Cylindrical	3A-46L5-V22
"BAKELITE"—See **Plastics**	
BALL RACES—RADIAL (Hardened Steel)	
Centerless	3A-80K7-V22
Cylindrical (Cups)	3A-80K7-V22
Surfacing Cups and Cylinders	9A-80F12-V23 Koolpore
Rough Grooving (Inner Race), Al. Oxide Vit.	
Finishing Grooving (Inner Race), Al. Oxide Rub.	A-180N4-R22
Rough and Finish Grooving (Inner Race—One Operation)	A-100N4-R22
Rough Grooving (Outer Race)	A-80S12-R22
Finish Grooving (Outer Race)	A-120T14-R22
Rough and Finish Grooving (One Operation—Outer Race)	A-100T14-R22
Internal Bores	3A-80L7-V22
BALL RACES—RADIAL (Soft Steel)	
Rough Surfacing	
Cups and Cylinders	9A-461I12-V22 Koolpore
BALL RACES—THRUST (Hardened)	
Surfacing	
Cups and Cylinders	9A-80F12-V23 Koolpore
Grooving	
Roughing	A-46Q6-BA2
Finishing	A-150T14-R22
BARS	
Centerless	A-60N6-V22
Cutting-Off (Dry)	
Low Carbon—Small	A-304U6-BJ2RS
Low Carbon—Large	A-304S6-BJ2RS
Hardened and High Speed	A-461P6-BJ2
Cutting-Off (Wet)	
Low Speed Machines	A-461R6-R22
High Speed Machines	A-461T6-R22

Recommended Specifications

Class of Work	*Specification*
BILLETS (Alloy and High Speed Steels)	
Cleaning	
Swing Frames	
9500 sfpm Maximum	3A-143S4-BA2
Portable Grinders	
6500 sfpm Maximum	A-20Q5-V22
9500 sfpm Maximum	3A-16Q4-BA2
BILLETS AND SLABS (Stainless Steel)	
Cleaning	
Swing Frames	
9500 sfpm Maximum	
Medium Pressure	A-143U4-BC2
Heavy Pressure	A-143ZZ5-BS2ZE
Cleaning	
Portable Grinders	
9500 sfpm Maximum	A-16Q4-BA2
BITS (Auger)	
Throat	A-24V8-R22
Fluting (Polishing)	A-603Q6-RQ2
BITS (Rock)—See **Rock Drills**	
BOLTS (Case Hardened)	
Centerless	A-60N6-V22
Cylindrical	3A-60M6-V22
BRAKE LININGS (Metal Filled)	
Cutting-Off (Dry)	C-30O6-BJ2
Surfacing—Discs	
Roughing	C-16J4-BA2
Finishing	C-24L4-BA2
BRAKE LININGS (Molded)	
Surfacing—Discs	
Roughing	C-16L4-BA2
Finishing	C-24M4-BA2
BRAKE SHOES (Railroad)—(Chilled Iron)	
Snagging	
6500 sfpm Maximum	C-20T4-V32
9500 sfpm Maximum	
Low Steel Additions	C-16S4-BA2
High Steel Additions	A-16R4-BA2

Class of Work	*Specification*
BRASS	
Centerless	C-361N5-V32
Cylindrical	C-361K5-V32
Cutting-Off—Wet	A-60V8-R22
Dry	A-30U6-BJ2
Internal	C-361J5-V32
Surfacing	
Cups and Cylinders	C-241H8-V32
Discs	C-20L4-BA2
Segments	C-241H8-V32
Snagging—Floor Stands	
6500 sfpm Maximum	C-20P4-V32 #4 Treated
9500 sfpm	C-16O4-BA2 #4 Treated
BRICK (Vitrified)	
Cutting-Off	
Coping	C-206Q4-BA2
Portable Saw	C-24P6-BJ2
Snagging	
Floor Stands	
6500 sfpm Maximum	C-16P4-V32
Surfacing	
Cups and Cylinders	C-201K8-V32
Discs	
Hard Brick	C-14M4-BA2AS
Firebrick	C-16Q4-BA2
Segments	C-201K8-V32
BROACHES—See **Pages 77-80**	
BRONZE (Soft)—See **Brass**	
BRONZE (Hard)	
Centerless	A-60M6-V22
Cylindrical	3A-46L5-V22
Internal	6A-60K6-V22
Snagging	3A-20P4-BA2 #4 Treated
Surfacing	
Discs	3A-16K4-BA2
Wheels—Types 1, 5, 7	8A-461J8-V22
Cutting-Off—Wet or Dry	A-24T6-R22
BUHR STONE	
Grooving (Narrow)	C-60W8-BJ2
Grooving (Wide)	C-24N4-V32

Recommended Specifications

Class of Work	*Specification*
BUSHINGS (Cast Iron)	
Centerless	C-461L5-V32
Cylindrical	C-461K5-V32
Internal	C-461J5-V32
BUSHINGS (Hardened Steel)	
Centerless	A-60M6-V22
Cylindrical	3A-60L6-V22
Internal	6A-60K6-V22
BUTTONS—See **Pearl Buttons** and **Plastics**	
CAMS (Automotive) (Hardened Steel)	
Roughing	3A-60L6-V22
Finishing	A-80R4-R22
Roughing and Finishing	
Hand Machines	A-70P8-BA2
Automatic Machines	A-70O8-BA2
CAMS (Automotive) (Cast Alloys)	
Roughing and Finishing	
Hand Machines	A-70P8-BA2
Automatic Machines	A-70O8-BA2
CAM SHAFT BEARINGS (Automotive)	
Cylindrical	A-46N5-V22
CAR WHEELS (Chilled Iron)	
Regrinding	
Cylindrical	
6500 sfpm Maximum	C-20Q4-V32
9500 sfpm Maximum	C-20Q4-BA2
CAR WHEELS (Steel)	
Regrinding	
Cylindrical	
6500 sfpm Maximum	A-20P5-V22
9500 sfpm Maximum	A-20Q4-BA2
CAR WHEELS (Manganese)	
Regrinding	
Cylindrical	
6500 sfpm Maximum	A-16Q5-V22
"CARBOLOY"—See **Cemented Carbides** Also see **Pages 77-80** and **Diamond Wheel Catalog**	
CARBON	
Centerless (Hard)	C-361N5-V32
Cutting-Off	
Hard	C-46N6-BJ2
Soft	C-36O6-BJ2
Stripping	C-36O5-B2
Surfacing	
Cups and Cylinders	C-161J8-V32
Discs	C-36M4-BA2
CARD CLOTHING	
Cylindrical	
6500 sfpm Maximum	A-20Q5-V22
9500 sfpm Maximum	A-20Q4-BA2
CAST IRON	
Centerless	C-461M5-V32
Cylindrical	C-361J5-V32
Cutting-Off	
Dry	A-30Q6-B2
Wet	A-46T6-R
Internal	C-461J5-V32
Snagging	
Floor Stands	
6500 sfpm Maximum	C-16R4-V32
9500 sfpm Maximum	C-16Q4-BA2
Snagging	
Swing Frames	
6500 sfpm Maximum	C-16S4-V32
9500 sfpm Maximum	C-16R4-BA2
Portable Grinders	
6500 sfpm Maximum	C-20R4-V32
9500 sfpm Maximum	C-16Q4-BA2
Surfacing	
Cups and Cylinders	C-241H8-V32
Discs	C-16L4-BA2
Segments	C-241H8-V32
Wheels—Types 1, 5, 7	C-361H8-V32
"CATALIN"	
Cutting-Off	
Dry	C-60O6-BJ2
Wet	C-100R0-R22

Class of Work	*Specification*
"CATALIN" (continued)	
Cylindrical	C-461J5-V32
Surfacing	C-36H8-V32
CEMENTED CARBIDES ("Carboloy"—"Firthite"—"Vascoloy Ramet"—"Kennametal")	
Also see **Pages 77-80** and **Diamond Wheel Catalog**	
Offhand Grinding, Cup Wheel	
Roughing	
Dry	3C-60G12-V32
Wet	3C-60H12-V32 D-100N4-M D-120M4-B
Finishing	
Dry	3C-120F12-V32
Wet	3C-120G12-V32 D-220M4-BA
Extra Fine Finish	D-320M4-BA
Off-hand Grinding, Straight Wheel	
Roughing	
Dry	1C-60H12-V32
Wet	1C-60I12-V32
Finishing	
Dry	1C-120G12-V32
Wet	1C-120H12-V32
Machine Grinding (Tool Grinders)	
Cup Wheel	
Roughing—Wet	1C-60G8-V32 D-120M4-BA
Finishing—Wet	1C-120F9-V33
Straight Wheels	
Roughing and Finishing—Wet	1C-80G8-V32 D-180M4-BA
Cutter Grinding	
Backing Off, Cup Wheel	
Roughing—Dry	1C-60G8-V32 D-120M4-BA
Finishing—Dry	1C-120F9-V33 D-180R4-BA
CEMENTED CARBIDES (continued)	
Surfacing, Straight Wheel	
Roughing	
Dry	3C-60G12-V32
Wet	3C-60H12-V32 D-120M4-BA
Finishing	
Dry	3C-120F12-V32
Wet	3C-120G12-V32 D-220M4-BA
Cylindrical Grinding	
Roughing—Wet	3C-60I8-V32 D-120N4-B
Finishing—Wet	3C-120H9-V32 D-240N4-BA
Internal Grinding	
Roughing	D-120L4-BA
Finishing	D-240L4-BA
Ultra-Finishing	D-400L4-BA
Hand Honing or Stoning	
Rectangular Stick	1C-220N-V D-320T4-V
Cutting-Off (Wet)	D-100R4-BA
CHAIN LINKS	
Snagging	
Floor Stands	
6500 sfpm Maximum	
Malleable Iron and Steel	2A-241R5-V22 3A-20R5-V22
Unannealed Malleable	C-16R4-V32
9500 sfpm Maximum	
Malleable Iron and Steel	3A-16Q4-BA2
Unannealed Malleable	C-16S4-BA2
CHILLED IRON	
Cylindrical (also see **Rolls**)	C-361K5-V32
Cutting-Off	
Dry	A-30Q6-BJ2
Wet	A-461S4-R22
Snagging	
Floor Stands	
6500 sfpm Maximum	C-16R4-V32
9500 sfpm Maximum	C-16P4-BA2
Surfacing	
Cups, Cylinders and Segments	C-241H8-V32
Wheels—Types 1, 5, 7	C-361H8-V32

Recommended Specifications

Class of Work	*Specification*
CHISELS—Also see **Pages 77-80**	
Woodworking—Sharpening	3A-80J7-V22
CHROMIUM PLATE	
Cylindrical	
Commercial Finish	3A-80K7-V22
Good Commercial Finish	3A-180I8-V22
High Finish	A-320J9-BC2
Internal	9A-60J6-V72K
CLAY BLOCKS	
Cutting-Off	D-36N2-M
Surfacing	
Cups and Cylinders	C-14N8-V32
Segments	C-16L8-V32
"COLMONOY"	
Cylindrical	C-361J5-V32
Internal	C-60I6-V32
Snagging	
6500 sfpm Maximum	C-30N4-V32
Surfacing	
Cups and Cylinders, Segments	C-361G8-V32
Tool Grinding	1C-60J6-V32
COMMUTATORS	
Roughing and Finishing	C-60L4-BA2
CONCRETE	
Hand Surfacing (Rubs)	C-24R-V
Machine Surfacing	
Straight Wheels	C-24Q-V
Cup Wheels	C-24O-V
Cutting-Off	C-201U6-BG2AA
CONNECTING RODS	
Internal	6A-60K6-V22
Surfacing	
Cups and Cylinders	8A-241J8-V22
Discs	3A-24M4-BA2
COPPER	
Cylindrical—Also see **Rolls**	C-120G9-V32
Cut-Off	
Bars—Dry or Wet	A-60V8-R22
Tubing and Small Sections Dry or Wet	A-80Q6-R22
Surfacing	
Cups and Cylinders	C-161I8-V32
Discs	C-36M5-BA2
CORK	
Cylindrical	9A-46I12-V22
COUPLERS AND DRAW BARS	
Snagging	
Floor Stand	
6500 sfpm Maximum	3A-14S5-V22
9500 sfpm Maximum	3A-14Q4-BA2
Swing Frames	
9500 sfpm Maximum	3A-12R4-BA2
Portable Grinders	
9500 sfpm Maximum	3A-16Q4-BA2
CRANKSHAFTS (Airplane)	9A-60K6-V22
CRANKSHAFTS (Diesel)	3A-46L5-V22
CRANKSHAFTS (Automotive)	
Pins and Bearings	
Roughing	
Heavy Stock Removal	A-36R5-V22
Light Stock Removal	A-46Q5-V22
Pins and Bearings	
Finishing	A-54O5-V22
Snagging (Balancing)	
6500 sfpm Maximum	3A-20O5-V22
9500 sfpm Maximum	3A-16M4-BCAS
Regrinding	3A-46L5-V22
Metallized	C-361K5-V32
CUT GLASS—See **Glass**	
CUTLERY—See **Knives**	
CUTTERS—See **Pages 77-80**	
CUTTERS	
Sharpening (Machine)	9A-461K5-V22
CUTTERS (Molding)	
Sharpening (Offhand)	A-60M6-V22
CYLINDERS (Automotive)—(Cast Iron)	
Regrinding (Wheels)	C-361H8-V22
Honing (Sticks)	
Roughing	C-120K-VB
Finishing	C-500H-VB
CYLINDERS (Aircraft)	
Molybdenum Steel	9A-54J5-V22

Class of Work	*Specification*
CYLINDERS (Aircraft) (continued)	
Nitrided	
Before Nitriding	3A-60J6-V22
After Nitriding	1C-60H8-V32
Regrinding	C-60I6-V32
DIES (Forgings)	
Portable Grinding	
Mounted Points	
Coarse	9A-60O5-V72K
Medium	9A-90O6-V72K
Fine	9A-120O7-V72K
Wheels—Types 1, 5, 7	
6500 sfpm Maximum	A-46Q5-V22
9500 sfpm Maximum	A-36Q4-BA2
DIES, THREADING	
See **Pages 77-80**	
DIES, DRAWING	
Portable Grinding—See **Dies** (Forgings)	
Surfacing—Hardened	
Cylinders, Cups and Segments	9A-301H8-V22
Discs	3A-46J5-BA2
Wheels—Types 1, 5, 7	9A-461H8-V22
DRILLS (Manufacture)	
Cutting-Off	
Dry	A-46Q6-BJ2
Wet	A-60T6-R22
Cylindrical	3A-54N5-V22
Centerless	
Soft	3A-60N6-V22
Hard	3A-80M7-V22
Sharpening	3A-46M5-V22
Pointing	
½″ Diameter and Under	3A-54K5-BC2
Over ½″ Diameter	3A-543N5-BC2
Relief	8A-46L5-V22
Flutes	
Grinding (Offhand)	
Large Size	A-46L4-RF2
Small Size	A-54L4-RF2
Flutes	
Polishing (Offhand)	
Large Sizes	A-603Q6-RQ2
Small Sizes	A-80E4-RG2CA
Resharpening—See **Pages 77-80**	

Class of Work	*Specification*
"FIRTHITE"	
See **Cemented Carbides**	
FIBER	
Centerless	C-361N5-V32
Cylindrical	C-361K5-V32
Surfacing	
Discs	C-14K4-BA2
FORGINGS	
Centerless	A-60M6-V22
Cylindrical	A-46M5-V22
Internal	3A-60K6-V22
Snagging	
6500 sfpm Maximum	3A-16R5-V22
9500 sfpm Maximum	3A-16Q4-BA2
Surfacing—Discs	3A-16L4-BA2
FORK TINES (Agricultural)	
Offhand	3A-36T5-V22
FROGS AND SWITCHES (Manganese Steel)	
Grooving	
Planer	
6500 sfpm Maximum	3A-16Q5-V22
9500 sfpm Maximum	3A-143P4-BA2
Swing Frame	
6500 sfpm Maximum	3A-14Q5-V22
9500 sfpm Maximum	3A-143P4-BA2
Surfacing	
Planer	
6500 sfpm Maximum	3A-14P8-V22
9500 sfpm Maximum	3A-143O4-BA2
Swing Frame	
6500 sfpm Maximum	3A-16Q5-V22
9500 sfpm Maximum	3A-143P4-BA2
Snagging	
Portable	
6500 sfpm Maximum	A-20P5-V22
9500 sfpm Maximum	A-16Q4-BA2
Swing Frames	
6500 sfpm Maximum	3A-16Q5-V22
9500 sfpm Maximum	3A-143Q4-BA2
GAUGES—Also see **Pages 77-80**	
Plug Gauges	
Cylindrical	
Roughing	9A-80K7-V22
Finishing	9A-120J8-V22
Ultra Finishing	A-320J9-BC2
Chrome Plates—See **Chromium Plate**	

BAY STATE ®
WHEELS of PROGRESS

Recommended Specifications

Class of Work	*Specification*
GEARS (Cast Iron)	
Cleaning Between Teeth	A-24J16-FA2
GEARS (Hardened Steel)	
Cylindrical	3A-54J5-V22
Form Grinding (Profiling)	9A-60K6-V22
Generative Grinding	
Lees-Bradner	9A-80J7-V22
Pratt & Whitney—12″	9A-60K6-V22
20″	9A-80J7-V22
Internal	6A-60J6-V22
Surfacing	
Cups, Cylinders and Segments	8A-301H8-V22
Discs	3A-24K4-BA2
Wheels—Types 1, 5, 7	8A-46I8-V22
GLASS (Circular Mirrors)	
Rough Beveling (Automatic)	C-80I5-V32
Rough and Final Beveling (Automatic)	A-220L8-V22
GLASS (Globes)	
Grinding Edges	C-80K8-V32
GLASS (Lenses)	
Edging—Machine	A-220O8-V22 D-220L4-MA
Surfacing	
Roughing	D-180L4-MA
Finishing	D-400J4-BA
GENERATING	
Write for specification information on lens generating	
GLASS (Plate)	
Edging	D-80L1-M
GLASS PRISMS	
Surfacing	
Roughing	D-180N2-MA
Finishing	D-400M4-BA
GLASS TUBING	
Cylindrical	D-180N1-MA C-80H8-V32
Internal	D-100N4-MA
GLASS (Tumblers)	
Edging—Lead Glass	C-120O8-V32
Edging—Lime Glass	A-150J8-V22

Class of Work	*Specification*
GLASS (Windshield)	
Seaming—Hand—Side of Wheel	C-90R7-V32
Round Edges—Machine	A-80N7-V22
Semi-Polish Edge—Hand	9A-150O8-V22
Edging Discs	C-100Q8-V32
GLASS, CUT	
Puntying (Concaving Bottoms of Glasses and Tumblers)	A-80M7-V72K
Beading—Deep	
Coarse	A-120N9-V72 K
Medium	A-150O9-V72 K
Fine	A-220O9-V72 K
Beading—Shallow	
Grapes and Petals	A-280K9-V72 K
Edging (Rich Cut Glass and Light Ware)	
Medium	A-180M9-V72K
Fine	A-220O9-V72 K
Engraving	
Punties—Flat Leaves, etc.	A-220O9-V72 K
Edge Cuts	A-280K9-V72 K
Fine Work	A-280Q9-V72 K
Fluting (Rich Cut Glass, Light Ware)	A-220N9-V72 K
Scalloping (Rich Cut Glass)	A-280K9-V72 K
Smoothing and Flat Work (Rich Cut Glass)	A-280K9-V72 K
GLASS GAUGES	
Cylindrical	
Roughing	1C-100H8-V32
Semi-Finishing	1C-220H9-V32
Final Finishing	A-500H9-BA2
Internal	
Roughing	D-100N4-MA
Semi-Finishing	D-220N4-MA
Surfacing (Vertical Spindle Rotary Chuck)	
Roughing	D-120N4-MA
Finishing	D-400L4-BA
GLASS LAMP SHADES	
Grinding Edges	A-180N8-V22 C-80K8-V32
GRANITE	
Coping	D-24N1-MA
Edging	C-24Q5-V32

Class of Work	*Specification*
GRANITE (continued)	
Molding	
6500 sfpm Maximum	C-36K5-V32
9500 sfpm Maximum	C-14O4-BA2
Finishing	C-36N5-BA2
Surfacing	C-16K7-BA2
Rubbing (Hand)	
Coarse	1C-180F-V
Medium	1C-220F-V
Fine	1C-400F-V
Cutting Margins (12″ to 16″ Dia. Wheels)	C-301Q5-B2
Cutting-Off	C-24N6-BJ2 D-46N2-M
GUIDE BARS	
Surfacing—Segments or Cylinders	3A-16M8-V22
HAMMERS (Claw)	
Grinding Between Claws	A-46U6-R22
Neck Grinding	A-30T4-BA2
Back and Sides	
6500 sfpm Maximum	3A-24Q5-V22
9500 sfpm Maximum	3A-30P4-BA2
HOUSINGS (Auto Axle)	
Centerless	A-60N6-V22
Cylindrical	A-46N5-V22
Snagging	
6500 sfpm Maximum	3A-14R5-V22
9500 sfpm Maximum	3A-16Q4-BA2
Surfacing	
Discs	3A-20M4-BA2AS
Segments	3A-16M8-V22
"KENNAMETAL"—See **Cemented Carbides** and **Pages 77-80**	
KNIVES (Butcher, etc.)	8A-1003F12-V22 #10 Treated
Hemming (Carbon Steel and Stainless)	3A-80L7-BA2
Offhand	
Surfacing Sides	A-150I8-V22
Sharpening Production	3A-100N7-V22
KNIVES (Hog)	
Sharpening (Cup Wheels)	3A-36K5-V22
KNIVES (Leather Dehairing)	
Sharp (Bricks)	A-36N5-V22
KNIVES (Leather Fleshing)	
Sharpening	A-36N5-V22
KNIVES (Leather Shaving)	
Sharpening	3A-60N6-V22
KNIVES (Leather Splitting)	
Sharpening	A-36K5-BA2
KNIVES (Molding)	
Offhand Sharpening	3A-46M5-V22
KNIVES (Pocket)	
Hemming (Carbon Steel and Stainless)	3A-100N7-BA2
Offhand	C-150N6-BC2
KNIVES (Table)	
Hemming (Carbon Steel and Stainless)	8A-802G12-V22 #10 Treated 3A-60L5-BA2
Offhand	C-150N6-BC2
KNIVES—Resharpening Machine Knife Blades for Paper, Veneer, etc.	
Segments	3A-36K5-BA2
Discs	3A-36K5-BA2
Wheels—Types 1, 5, 7	8A-461J5-V22
LATHE CENTERS	3A-60K6-V22
LEATHER—See **Knives** for Leather Knife Wheel Recommendations	
Finishing or Napping, Chamois Leather	C-16L4-V32
Sueding (Drum Wheel)	C-60M5-V32
Miscellaneous Grinding	C-36J12-V32
LIMESTONE	D-46N2-M
Cutting-Off (Portable)	C-24P6-BJ2
Molding	C-36K5-V32
Sawing (Steel Centers) Coping	C-206P4-BA2
Surfacing (Drum Rubber)	C-24K5-V32
Rubbing (Hand)	C-46L-V
LINKS (Locomotive)	
Machine Grinding	A-36Q5-V22
LINKS—CHAINS—See **Chain Links**	
MACHINE SHOP GRINDING	
General Offhand	
Coarse	A-24P5-V22
Medium	A-36N5-V22
Fine	A-46M5-V22

Recommended Specifications

Class of Work	*Specification*
MAGNESIUM	
Snagging	
6500 sfpm Maximum	C-24N5-V32 #4 Treated
9500 sfpm Maximum	3A-161N5-BA2AS #4 Treated
MALLEABLE IRON (Annealed)	
Floor Stands	
6500 sfpm Maximum	2A-161R5-V22
9500 sfpm Maximum	3A-16O4-BA2
Swing Frames	
9500 sfpm Maximum	3A-16P4-BA2
Portable Grinders	
6500 sfpm Maximum	3A-20Q5-V22
9500 sfpm Maximum	3A-20Q4-BA2
Surfacing—Discs	3A-16L4-BA2
MALLEABLE IRON (Unannealed)	
Floor Stands	
6500 sfpm Maximum	C-20R4-V32
9500 sfpm Maximum	C-16P4-BA2
Surfacing—Discs	C-16M4-BA2
MARBLE	
Coping (All Wet)	
Resinoid—Steel Centers	C-206P4-BA2
Diamond Metal Bonded	D-46N2-M
Moldings—6500 sfpm Maximum	
Roughing	C-12M4-V32
Finishing	C-36K5-V32
Moldings—9500 sfpm Maximum	
Roughing	C-12M4-BA2
Finishing	C-36N5-BA2
Surfacing	
Roughing	C-12M4-V32
Finishing	C-36K5-V32
Balusters and Columns	
Slotting (Steel Centers) (Wet)	C-24P8-BA2 D-46N2-M
Roughing	C-12M4-V32
Finishing	C-120K-V
Slabs (Polishing)	
First Gritting (Rubs)	C-36K5-V32
Second Gritting (Rubs)	C-60K-V
Third Gritting (Rubs)	A-220I9-V22

Class of Work	*Specification*
METALLIZING (Sprayed Metal)	
Cylindrical	C-361K5-V32
Cutting-Off (Wet)	A-46U8-R22
METALLOGRAPHIC SPECIMENS	
Smoothing (All Types)	
Roughing	3A-46L5-V22
Finishing	A-120K8-V22
Machine Surfacing	9A-46J5-V22
Cutting-Off—Wet	A-60M6-R22
MINERALS—LAPIDARY (Offhand)	
Roughing	1C-80M8-V32 1C-120M8-V32
Finishing	1C-180L9-V32 1C-220L9-V32
Cutting—Wet	D-46N1-M
MONEL METAL	
Cutting-Off—Dry	A-36N6-BJ2
Wet	A-54X6-RC2
MOTOR STATORS AND ROTORS	
Cylindrical	3A-36M5-V22
Internal	3A-46K5-V22
MOLDED PRODUCTS—See **Plastics**	
NEEDLES	
Pointing	
Hypodermic (Stainless Steel)	A-320H16-FA2
Miscellaneous (Hard Stainless)	A-100R8-V22
NICKEL	
Cutting-Off (Dry)	A-46Q6-BJ2
Cutting-Off (Wet)	A-54X6-RC2
NITRALLOY	
Before Nitriding	3A-46K5-V22
After Nitriding	C-100H8-V32
ONYX	
Molding	C-36K5-V32 C-24P6-BA2
Coping (Steel Centers)	D-46N2-M

BAY STATE

WHEELS of PROGRESS

Recommended Specifications

Class of Work	*Specification*
PEARL BUTTONS	
Surfacing	C-36N5-V32
Roughing Rough Blanks	C-36O5-V32
Slitting	C-80R6-R22
Grooving	C-180Q9-V32
Grinding Fish Eyes	C-120Q8-V32
PEARL NOVELTIES	
Offhand Roughing	C-80Q8-V32
Offhand Finishing	C-180Q9-V32
PINS	
Pointing	A-80T7-V2
PIPE AND PIPE FITTINGS	
Cutting-Off	
Dry	A-304U6-BJ2RS
Wet	A-36X6-RC2
Snagging (Cast Iron)	
Floor Stands	
6500 sfpm Maximum	C-16R4-V32
9500 sfpm Maximum	C-16Q4-BA2
Portable	
9500 sfpm Maximum	C-20R4-BA2
Surfacing—Discs	
Fittings—Brass	C-20L4-BA2
Fittings—Cast Iron	C-16K4-BA2
Fittings—Steel	3A-16L4-BA2
PIPE BALLS (Manganese)	
Centerless	
Roughing	A-24R5-V22
Regrinding	A-30P5-V22
Cylindrical	
Roughing	A-30Q5-V22
Regrinding	A-30N5-V22
PISTONS (Aluminum)	
Plain Centerless	C-461I5-V32
Cylindrical	C-461K5-V32
PISTONS (Cast Iron)	
Centerless—Rough	C-461L5-V32
Semi-Finish	C-80K7-V32
Finish	C-280R9-BC2
Cylindrical	C-361K5-V32
PISTON PINS	
Centerless	
Roughing (Soft)	3A-60M6-V22
Roughing (Hard)	3A-80M7-V22
Finish (Hard)	A-120K8-V22

Class of Work	*Specification*
PISTON PINS (continued)	
Lapping (Norton Hyprolap)	C-500J9-BA2
Surfacing Ends (Discs)	A-60L6-BA2
PISTON RINGS (Cast Iron or Semi-Steel)	
Snagging	
Cylindrical	C-241L5-V32
Surfacing	
Rough (Cylinders)	9A-301H8-V22
Surfacing	
Disc (Parallel)	
Rough	C-24L4-BA2
Semi-Finish	C-46L5-BA2
Finish	C-70M6-BA2
Straight Wheels (Roughing)	A-70L8-V22
Internal (Snagging)	C-36S5-V32
PISTON RODS (Locomotive)	
Cylindrical	A-46M5-V22
PLASTERBOARD (Celotex, Gypsum, Masonite)	
Cutting-Off	C-24T6-BF2
Beveling	9A-46J12-V22
PLASTICS	
Centerless	C-461L5-V32
Cutting-Off—Dry	C-46K6-BJ2
Wet	C-120L0-R22
Cylindrical	
Heavy Stock Removal	C-361L5-V32
Light Stock Removal	C-60J6-V32
Internal	C-60H8-V32
Surfacing	
Discs	C-36J4-BA2
PLOWS (Steel)	
Surfacing	4A-16T5-V22
Edging and Jointing	A-16R5-V22
Fitting	A-24Q5-V22
Resharpening Point	A-20R5-V22
PLOWS (Chilled Iron)	
All Operations (Dry)	A-20O5-V22
(Wet)	A-20R5-V22
PORCELAIN	
Centerless	
Roughing	C-361K5-V32
Finishing	C-100I8-V32

Recommended Specifications

Class of Work	*Specification*
PORCELAIN (continued)	
Cylindrical	
Small Wheels	D-100N4-MA
Large Wheels	
Roughing	C-461J5-V32
Finishing	C-120H8-V32
High Finish	A-500H9-BA2
Cutting-Off	
Fired—Wet	C-120L0-R22 D-100N4-M
Prefired—Dry	C-46K6-BJ2
Surfacing	
Discs	C-30K4-BA2
PULLEYS (Cast Iron)	
Cylindrical	C-361J5-V32
Rough with Pulley Grinder (Cylinder Wheel)	C-241I8-V32
Finish with Pulley Grinder (Cylinder Wheel)	C-80N6-BA2
QUARTZ CRYSTALS	
Slabbing and Resawing	D-46N1-M
Wafering	D-60 to 100N1-M
Dicing	D-220N2-M
Edging Wafers (Cup Wheels)	D-180 to D220J2-BA
RAILS—Surfacing	
Track Blocks	3A-143K5-V22
Surfacing (Welds)	
6500 sfpm Maximum	A-24R5-V22
9000 sfpm Maximum—Cup Wheels	A-143M4-BA2
Wheels—Type 1	3A-143Q4-BA2
Slotting Joints	A-30S7-BJ2
RAZORS—Straight	
Burring	A-46O5-V22
Side of Tang	A-60N6-V22
Concaving	A-60M6-V22
Shoulders (Cutting In)	A-80O5-V22
Shoulders (Shaping after Hardening)	A-100M8-V22
Edging (Roughing)	9A-80K7-V22
Edging (Finishing)	A-220J9-BC2
Point Shaping	A-60N6-V22
RAZORS—Safety	
Write for special applications	
RAWHIDE	
Surfacing—Discs	C-14L4-BA2

Class of Work	*Specification*
REAMERS—See **Pages 77-80**	
RIFLE BARRELS	
Cylindrical	A-46M5-V22
RIMS (Automobile)	
Welds	
6500 sfpm Maximum	A-24Q5-V22
9500 sfpm Maximum	A-24R4-BA2
ROCK DRILLS	
Forming	3A-361N5-V22
Gauging	3A-36R5-V22
ROLLER BEARING CUPS	
Centerless	A-80L7-V22
Cylindrical	3A-46M5-V22
Internal	6A-70N6-V22
ROLLERS FOR BEARINGS	
Centerless	
Roughing	3A-80M7-V22
Finishing	A-90R2-R22
Cylindrical (Large Rollers)	A-60L6-V22
ROLLS (Brass or Copper)	
Roughing	C-301K7-EC2
Finishing	C-80J7-EC2
ROLLS, HOT MILL (Chilled Iron)	
Regrinding	
Roughing	C-361M7-BC2
Roughing (Light Machines)	C-361K7-BC2
Cutting Down Fire-Cracked Rolls	C-241M6-BC2
New Rolls	
Roughing (Standard Machine)	C-24P4-BC2
Roughing (Heavy and Amply Powered Machine)	A-301U4-BC2
Finishing	C-361K7-BC2
Cutting-Off Wabblers	C-24Q4-BJ2
Cutting Key Ways in Roll Necks	C-24Q4-BA2
ROLLS, COLD MILL (Hardened Steel)	
Regrinding	
Fast Cutting Action and Satin Finish	3A-120J7-V22
Lighter Type Machines	A-80J7-BC2 or A-80I8-EC2
High Finish	C-150L8-BA2 or A-150K9-EC2
Mirror Finish	C-400G7-BA2 or LA-G7-BA2

Class of Work	*Specification*
ROLLS, COLD MILL (Chilled Iron)	
Regrinding	C-80I8-EC2 or C-100I7-BC2
Mirror Finish	C-400G7-BA2 or LA-G7-BA2
New Rolls	
Roughing	C-24Q4-BC2
Finishing	C-361K5-BC2
ROLLS, STECKEL-MILL (HS Tool Steel)	
Regrind	3A-100I8-V22
Semi-Finish	C-320G7-BC2
Finish	LA-G7-BA2
ROLLS, BACK-UP (Cast Steel)	
Regrind on New Rolls	A-241K6-BC2
ROLLS, PAPER MILL (Chilled Iron, Brass, Rubber, Granite)	
Chilled Iron	
Regrinding	C-54K7-EC2
Roughing	C-361K7-EC2
ROLLS, RUBBER (Rubber Covered Press Rolls)	
Regrind	C-241K5-BC2
Finishing	C-60K7-EC2
ROLL SCOURING (Bricks)	
Medium	C-80K7-V22
Fine	C-120K8-V22
ROLLS (Miscellaneous)	
Copper Cylinders (Rotogravure Presses)	
Roughing after Plating	C-461K5-V32
Remove Etching	C-100G8-V32
Polishing	LA-G7-BA2
ROLLS, STEEL (Chromium Plated)	
Finish after Plating	3A-100J8-BC2
RUBBER	
Cylindrical	
Soft Rubber	C-14L4-BA2
Medium Rubber	C-24K4-BA2
Hard Rubber	C-30K4-BA2
Centerless	C-361K5-V32
Cutting-Off	C-30M6-BJ2
Slitting	C-461N8-BJ2

Class of Work	*Specification*
SAD IRONS	
Surfacing	
Cups, Cylinders	9A-16I8-V22
Discs	C-16L4-BA2
Segments	9A-241H8-V22
Snagging	
6500 sfpm Maximum	C-16Q4-V32
9500 sfpm Maximum	C-14P4-BA2
SAND CORES	
Cutting-Off	C-24R6-BJ2
Surfacing—Discs	C-20L4-BA2
SAWS (Band)	
Gumming	3A-361N6-BA2HL 3A-46M5-V22
SAWS (Circular)	
Gumming	3A-361N6-BA2HL 3A-46M5-V22
SAWS (Metal Cutting and Slitting)	
See **Pages 77-80**	
SCISSORS AND SHEARS (Cast Iron)	
Surfacing Sides of Blades	C-100S7-V32
SCISSORS AND SHEARS (Steel)	
Surfacing Sides of Blades	
Cylinders	A-150N7-BA2
Grinding Flash from Bows	A-46Q5-V22
Pointing and Shaping	A-54P6-V22
Strike Cutting Edges	A-120O8-V22
Resharpening	9A-100M8-V22
SHEAR BLADES (Power Metal Shears)	
Sharpening (Segments)	3A-461G8-V22
Sharpening (Cylinders)	9A-461G8-V22
SHOVELS	
Edging	A-24R5-V22
SILVER PLATE	
Cylindrical	C-120J8-V32
SKATE BLADES	
Surfacing Sides	A-60N6-BA2
Surfacing Bottom	3A-46N5-V22
Resharpening	3A-60N6-V22
SLATE	
Cutting-Off (Portable)	C-24O6-BJ2
Coping (Steel Centers)	C-206P4-BA2
Molding	C-46K5-V32

Recommended Specifications

Class of Work	*Specification*
SPLINE SHAFTS	
Cylindrical	3A-54N5-V22
Centerless Splines	A-60O6-V22
Grinding (Straight Wheels)	3A-54K5-V22
SPRINGS (Leaf)	
Grinding Eyes	3A-20P5-V22
Chamfering	3A-20T5-V22
SPRINGS (Coil)	
Squaring Ends—Discs	
Large Gage Wire	A-16Q4-BA2
Medium Gage Wire	A-36N4-BA2
Small Gage Wire	A-54N4-BA2
STEEL CASTINGS (Low Carbon)	
Swing Frames	
9500 sfpm Maximum	A-143P4-BA2
Floor Stands	
6500 sfpm Maximum	3A-16Q5-V22
9500 sfpm Maximum	A-16O4-BA2
Portable Grinders	
6500 sfpm Maximum	A-20Q5-V22
9500 sfpm Maximum	A-20Q4-BA2
STEEL CASTINGS (Manganese)	
See also **Frogs and Switches**	
Swing Frame	
9500 sfpm Maximum	3A-143Q4-BA2
Floor Stands	
6500 sfpm Maximum	A-20P5-V22
9500 sfpm Maximum	3A-143P4-BA2
Portable Grinders	
6500 sfpm Maximum	A-24Q5-V22
9500 sfpm Maximum	3A-20Q4-BA2
Surfacing	
Planer Type	
6500 sfpm Maximum	A-16P5-V22
9500 sfpm Maximum	3A-143P4-BA2
Cylindrical	
Boring Mills Type	
6500 sfpm Maximum	A-24L5-V22
9500 sfpm Maximum	3A-16P4-BA2
Internal	
Internal Type	
6500 sfpm Maximum	A-20P5-V22
9500 sfpm Maximum	3A-24Q4-BA2

Class of Work	*Specification*
STEEL (Hardened)	
Centerless	3A-60L6-V22
Cylindrical	3A-60K6-V22
Surfacing	
Cylinders and Segments	9A-301H8-V22
Discs	3A-30K4-BA2
Straight Wheels—Types 1, 5, 7	9A-461H8-V22
Internal	9A-60J5-V22
Cutting-Off	
Dry	A-46N6-BJ2
Wet	A-60P6-R22
STEEL (High Speed)—Also see **Billets**	
Centerless	3A-60L6-V22
Cylindrical	3A-60K6-V22
Surfacing	
Cylinders and Segments	9A-361G8-V22
Discs	3A-36J5-BA2
Straight Wheels—Types 1, 5, 7	9A-461I12-V22
Internal	9A-46J5-V22
Cutting-Off	
Dry	A-36O6-BJ2
Wet	A-461X6-RC2
STEEL (Soft)	
Centerless	A-60M6-V22
Cylindrical	A-46M5-V22
Surfacing	
Cylinders and Segments	9A-241G8-V22
Discs	3A-16M4-BA2
Straight Wheels—Types 1, 5, 7	9A-361J8-V22
Internal	3A-46M5-V22
Cutting-Off	
Dry	A-304U6-BJ2RS
Wet	A-461X6-RC2
STEEL (Stainless—Free Machine)—Also see **Billets**	
Centerless	C-54N6-V32
Cylindrical	C-361L5-V32
Surfacing	
Cylinders and Segments	9A-361G8-V22
Straight Wheels—Types 1, 5, 7	9A-461H8-V22
Internal	C-361K5-V32

Class of Work	*Specification*
STEEL (Stainless—Free Machine) (continued)	
Cutting-Off	
Dry	A-36R6-BJ2
Wet	A-461X6-RC2
Tubing (Wet)	A-80U10-R22
STEEL (Stainless Hard—Heat Treated)—Also see **Billets**	
Centerless	3A-60L6-V22
Cylindrical	3A-60K6-V22
Surfacing	
Cylinders and Segments	9A-361G8-V22
Straight Wheels—Types 1, 5, 7	9A-461H8-V22
Internal	3A-60K5-V22
Cutting-Off	
Dry	A-46O6-BJ2
Wet	A-461X6-RC2
STONE (Artificial)	
See **Limestone**	
STOVE PARTS (Cast Iron)	
Snagging	
Floor Stands	
6500 sfpm Maximum	C-24T5-V32
9500 sfpm Maximum	C-20Q4-BA2
Fitting and Mounting	A-30R5-V22
Notching	A-24R4-R22
Grinding Out Core Holes	C-24Q5-V32
Surfacing Tops (Automatic Machine)	
Roughing	C-24P5-V32
Finishing	C-60Q6-V32 C-46P5-BA2
Surfacing, Miscellaneous Parts	
Discs	C-16L4-BA2
STUDS—See **Bolts**	
TANTUNG (Off-Hand)	3A-60L6-V22
TAPS	
See **Pages 77-80**	
TAPS (Threading)	
See **Thread Grinding, External**	

Class of Work	*Specification*
TERRA COTTA	
Cutting-Off	
Wet	D-46N1-MA
Surfacing	
Discs	C-20M4-BA2
THREAD GRINDING	
External	
Thread Form 60°	
8 Pitch and Under	A-80S9-BA2 9A-80J8-V22
8–12 Pitch	A-100T9-BA2 9A-100K8-V22
12–16 Pitch	A-1202T9-BA2 9A-150L8-V22
16–36 Pitch	A-150T9-BA2 9A-220M8-V22
36–60 Pitch	A-180T9-BA2 9A-280N8-V22
60 and Finer	A-220T9-BA2 9A-320N8-V22
Internal	
Thread Form 60°	
8 Pitch and Under	A-60V9-BA2 9A-80K8-V22
8–12 Pitch	A-80V9-BA2 9A-120L8-V22
12–16 Pitch	A-100V9-BA2 9A-150M8-V22
16–36 Pitch	A-120V9-BA2 9A-220N8-V22
36–60 Pitch	A-150V9-BA2 9A-280N8-V22
TILE	
Cutting-Off—Miscellaneous	
Medium—Soft Tile	C-24O6-BJ2
Very Hard Tile (Wet)	D-46N1-MA
TOOLS	
See **Pages 77-80**	
"TRANSITE"	
Cutting-Off	C-20P6-BJ2
TUBES (Steel)	
Centerless	3A-60M6-V22
Cutting-Off (Steel Tubes)	
Finish Not Important (Dry)	A-301U6-BJ2RS
Good Finish (Wet or Dry)	A-80V10-R22
Stainless (Wet or Dry)	A-80U10-R22

Recommended Specifications

Class of Work	*Specification*
TUBING (Brass)	
Cutting-Off	
Dry	A-80V8-R22
Wet	A-100V8-R22
TUNGSTEN CARBIDE ALLOYS	
See **Cemented Carbides**	
See **Diamond Wheel Catalog**	
See **Pages 77-80**	
TUNGSTEN RODS	
Cutting-Off—Wet	A-120U8-R22
Centerless	C-60J6-V32
VALVES (Automotive)	
Refacing	3A-80L5-V22
	C-80L5-V32
Stems	
Cylindrical	A-54N5-V22
Centerless	3A-60O6-V22
Cutting-Off	A-301U7-BJ2
Surfacing Ends—Discs	3A-36J4-BA2
VALVE SEAT INSERTS	
Regrinding	
Roughing	
Cast Iron	C-60K6-V32
Alloy Steel	6A-60L6-V22
Stellite	9A-54K6-V22
Finishing	
All Seats	C-120K7-V32

Class of Work	*Specification*
VALVE TAPPETS	
Centerless	3A-80N7-V22
Cylindrical	A-46M5-V22
"VASCOLOY RAMET"	
See **Cemented Carbides**	
See **Diamond Wheel Catalog**	
See **Pages 77-80**	
VITREOUS WARE	
Surfacing	
Segments and Cylinders	C-241K8-V32
WELDS (Hard Surfacing Metals)	
Cleaning (Portable Tools)	
6500 sfpm Maximum	3A-24Q5-V22
9500 sfpm Maximum	3A-24Q4-BA2
See also **Reinforced Resinoid Products Catalog**	
WORMS	
Pratt & Whitney and Similar Machines	
Generating Forms	8A-54I6-V22
Excello, Jones and Lamson and Similar Machines	
Generating Forms	9A-80I7-V22
WRENCHES	
Snagging	
6500 sfpm Maximum	3A-24Q5-V22
Surfacing—Discs	A-20L4-BA2
WROUGHT IRON	
Snagging	
6500 sfpm Maximum	A-16K5-V22

BAY STATE
WHEELS of PROGRESS

BAY STATE ABRASIVE PRODUCTS CO., WESTBORO, MASSACHUSETTS, U.S.A.

Bay State Abrasive Products Co. is centrally located in Westboro, Massachusetts, two miles off the Boston-Worcester Highway, Rt. 9.

Branch Offices and Warehouses

CHICAGO, 3701 West 49th St.
CLEVELAND, 9550 Granger Rd.
DETROIT, 25600 Princeton Rd. (Inkster)
HOUSTON, TEXAS
LOS ANGELES, 4405 E. Olympic Blvd.
PITTSBURGH, 1691 Washington Rd.

Subsidiaries:

Bay State Abrasive Products Co. (Canada) Ltd.,
Brantford, Ontario, Canada

Felker Manufacturing Company,
1128 Border Avenue, Torrance, California

Bay State Abrasives S/A Luxembourg,
Steinsel, Luxembourg

Distributors:

All Principal United States Cities
South American and European Countries

BAY STATE
WHEELS of PROGRESS

Form 2432

50M-12/62 Printed in U.S.A.

BAY STATE ABRASIVE PRODUCTS CO.
Westboro, Massachusetts, U. S. A.